THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXV. No. 1913.] LONDON, JANUARY 9, 1900. [52ND YEAR. PRICE 6d.

ABSALOM HARROP
(Maker to the Admiralty),
FITZROY BELLOWS WORKS,
SHEFFIELD.

MANUFACTURER OF THE PATENT
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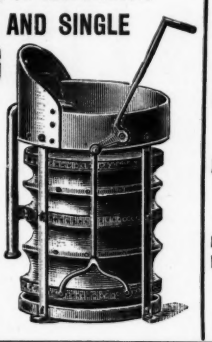
BLAST BELLOWS



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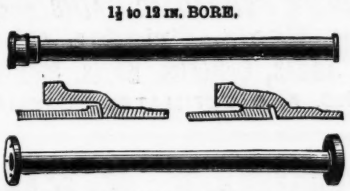

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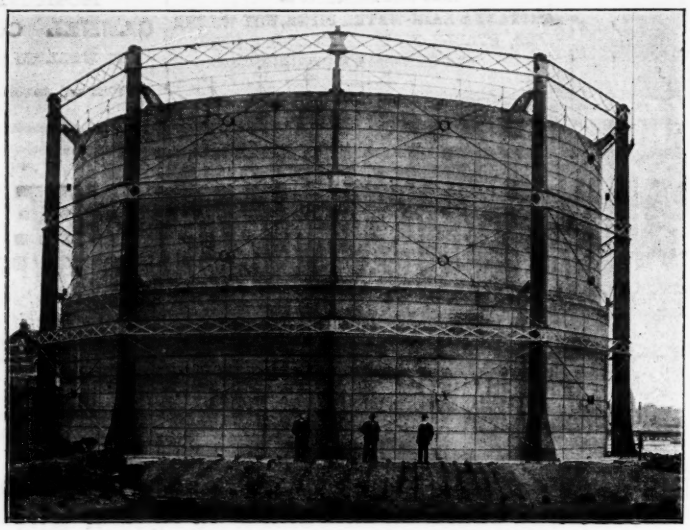

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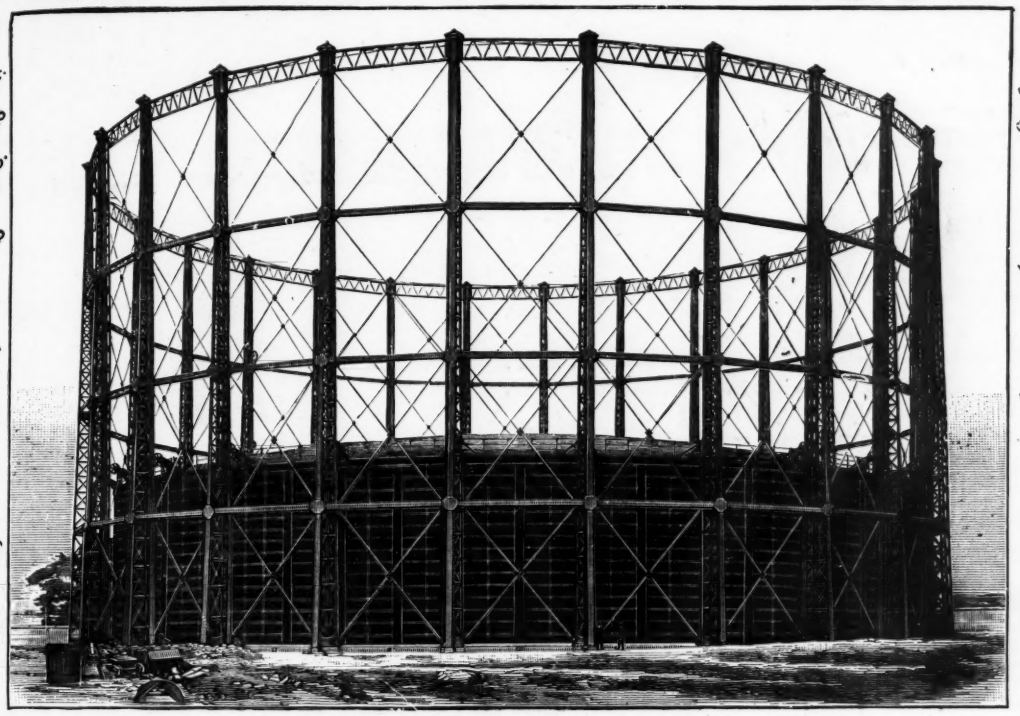

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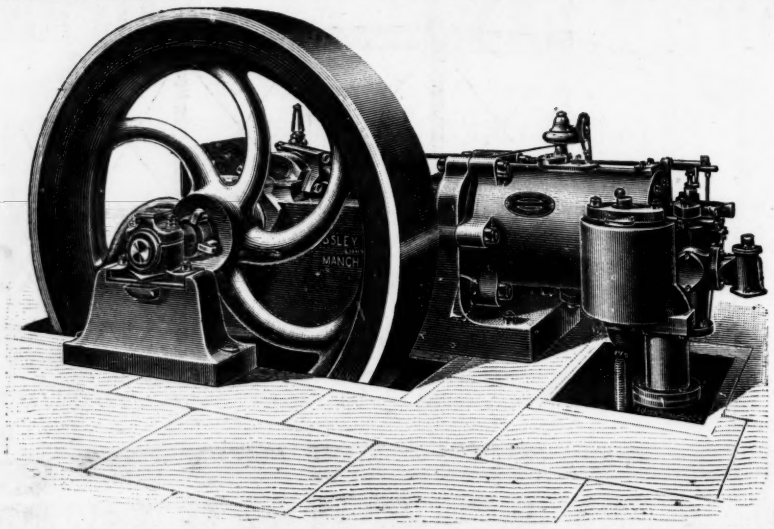

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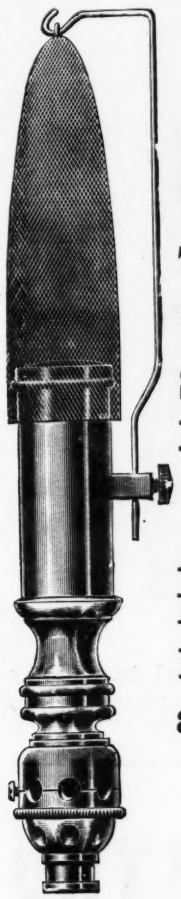

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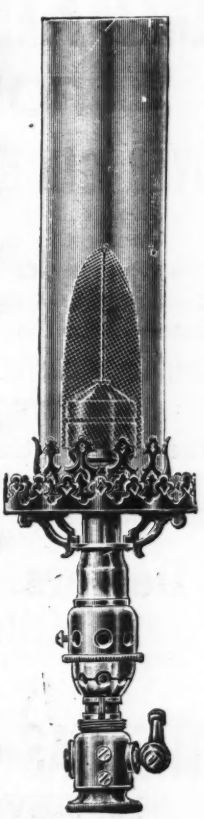

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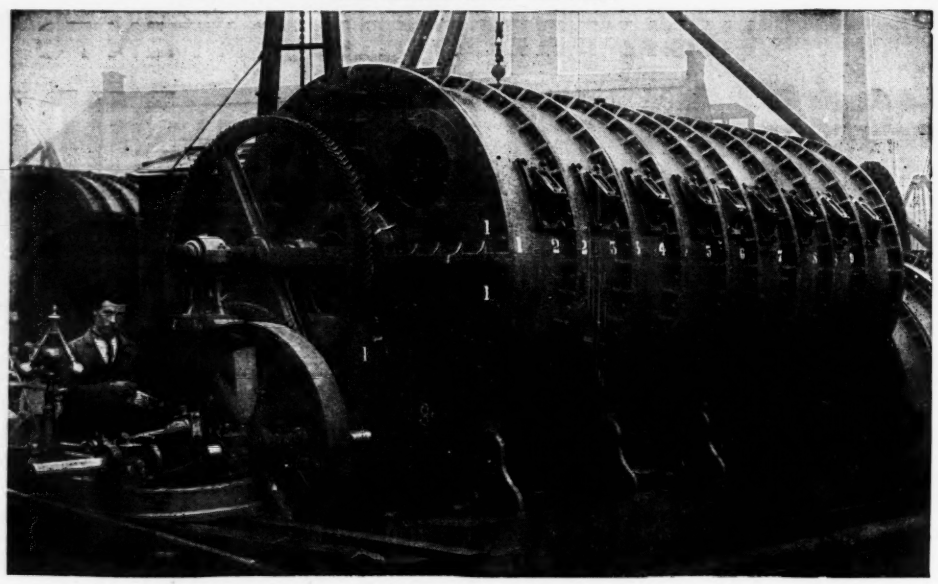

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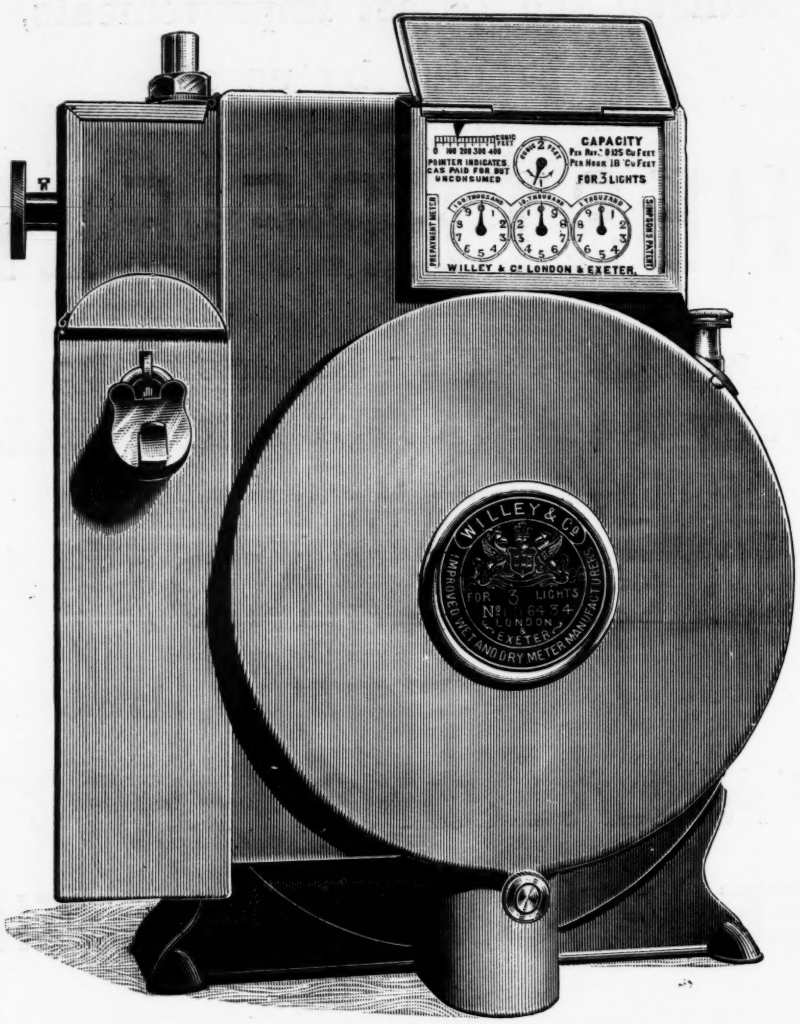

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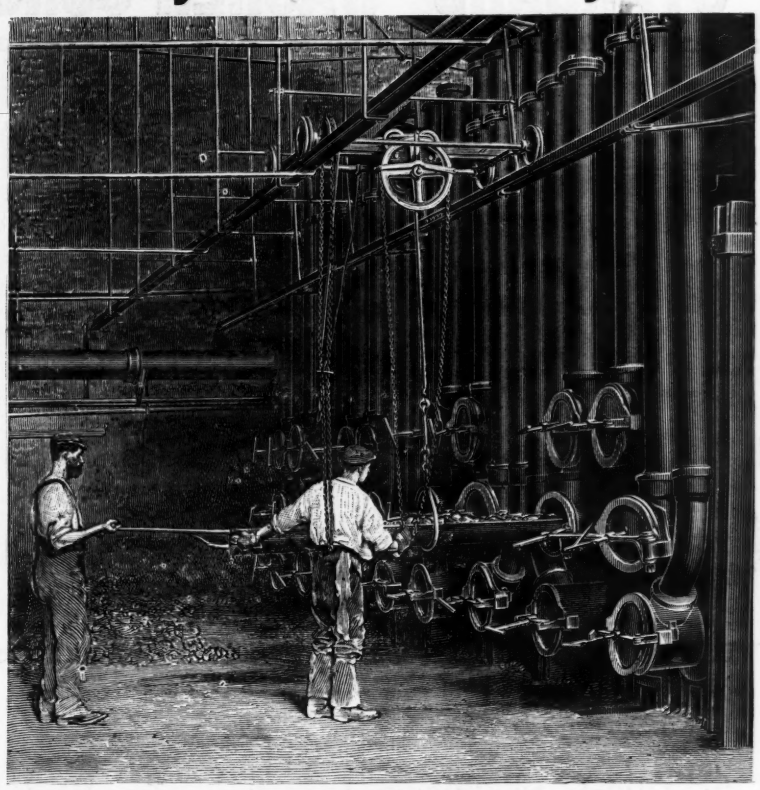

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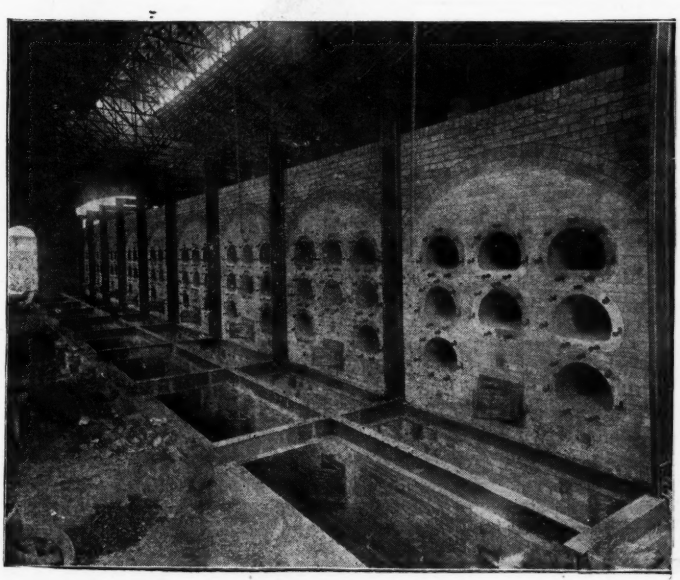

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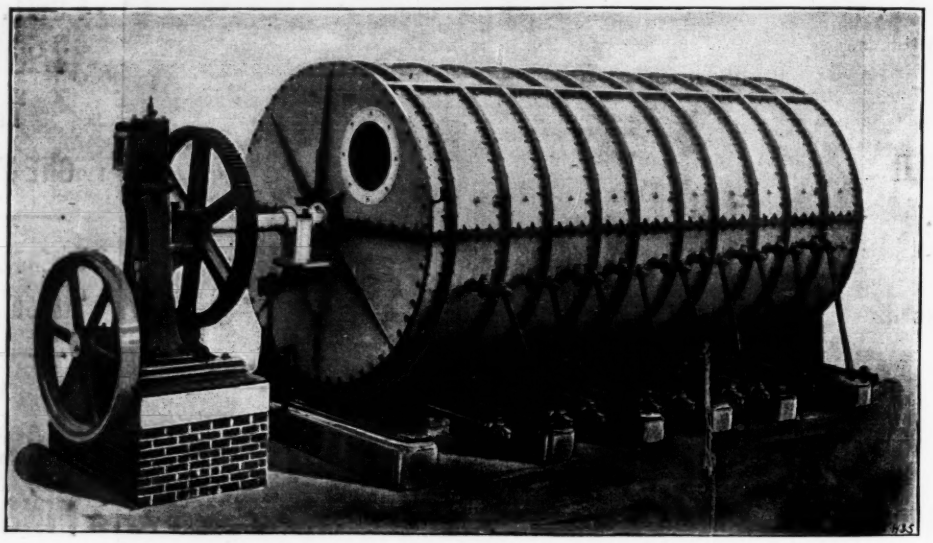

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Liverpool (Second Contract)	4,500,000
Tottenham	750,000
Tottenham (Second Contract)	750,000
Santiago de Cuba	400,000
Swansea	750,000
Manchester	3,000,000
Brighton	1,750,000
Preston	1,500,000
New York	1,200,000
Southport	750,000
Bath	1,000,000
Newburgh, N.Y.	350,000
Newburgh, N.Y. (Second Contract)	250,000
Hoylake	125,000
Coventry	600,000
Coventry (Second Contract)	600,000
Bordentown, N.J.	125,000
Winchester	200,000
Shanghai	225,000
Stockport	500,000
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Holyoke, Mass.	600,000
Lea Bridge	350,000
Lea Bridge (Second Contract)	350,000
Stockton-on-Tees	500,000
St. Joseph, Mo.	750,000
Edinburgh	2,000,000
Guildford	350,000
Brentford	1,200,000
Bridlington	125,000
Syracuse, N.Y.	850,000
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Croydon	1,250,000

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Utrecht	1,000,000
Deventer	150,000
Portsmouth	1,000,000
Bournemouth	1,000,000
Aylesbury	150,000
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Redhill	275,000
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The Gaslight and Coke Co., Beckton	2,250,000
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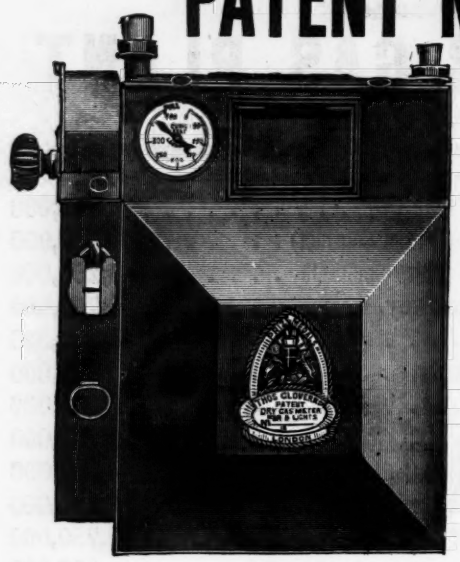

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CONTENTS.

EDITORIAL NOTES:—
GAS, LIGHTING, &c.— PAGE.
The London Gas Settlement . . . 73
Points of Prospective Gas Legislation . . . 74
A Further Shortening of the Labour Supply . . . 74
Compensation and Wages Questions at Manchester . . . 74
The Strikes and Lock-Outs of 1898 . . . 75
A Curious Side of the Workmen's Compensation Act . . . 75
Government and the Housing Problem . . . 75
WATER AND SANITARY AFFAIRS—
The Proposed Reconstitution of the Lea Conservancy Board . . 76
Rejection of the Southampton Corporation's Water Scheme . . 76
ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market . . . 77
Electric Lighting Memoranda . . . 77
A French Review of Photometry . . . 77
Recent Literature on Acetylene . . . 79
Gas Bills for 1900 . . . 79
Dr. Bueb's Cyanide Recovery Process . . . 80
The Duties and Responsibilities of Auditors . . . 81
The Introduction of Gaslight into Paisley . . . 82
NOTES:—
The Lubrication of Machinery; The Portability of Oil Fuel; Mechanical Coke Quenching; The Efficiency of the Westinghouse Gas-Engine; Tests of Fireproof Building Construction; Sir W. Crookes's Alarmist Address . . . 84
TECHNICAL RECORD:—
Installation of Inclined Retorts at the Leigh (Lancs.) Gas-Works . 85
The Electrolysis of Cast-Iron Water-Mains . . . 86
REGISTER OF PATENTS:—
Retort-Lid Fasteners—Holman, S. . . . 87
Internal Combustion Engines—Kitchen, J. G. A. . . . 87
Internal Combustion Engines—Hamilton, J. H. . . . 87
Extracting Naphthalene from Gas—Irwin, W., and Leather, J. P. . 87
Gas-Motor Engines—Nunn, F. C., and White, T. H. . . . 87
Feeding Boiler and Other Furnaces and Removing Ash and Clinkers—Abel, C. D. (La Compagnie Anonyme Continentale pour la Fabrication des Compteurs à Gaz et Autres Appareils) . 87
Generating Acetylene—Llorens, J. . . . 88
Regulator for Gases and Liquids—Mühlenthal, S., Löwenthal, M., and Hahn, T. . . . 88
Carburetting or Enriching Gas—Irwin, W. . . . 88
Patent Notices . . . 88
CORRESPONDENCE:—
How Far has the Gas Workers' Union been Recognized? . . . 89
Gas Purification in Germany . . . 89
LEGAL INTELLIGENCE:—
The Rating of Reservoirs . . . 89
Claim in Respect of Injuries Caused by the Honley Explosion . 89
MISCELLANEOUS:—
Manchester Corporation Gas Supply . . . 90
The Fatal Explosion at the Douglas Gas-Works . . . 91
The Royal Aquarium Gas Exhibition . . . 92
The Brigg and Skipton Arbitrations . . . 93
American Coal-Gas Statistics . . . 93
Ammoniacal Liquor and Sulphate of Ammonia in the States . . 93
Electric Lighting Notes . . . 94
Mineral Oil and Paraffin Industry of Scotland during 1899 . . . 95
Notes from Scotland . . . 96
Gas and Water Companies' Stock and Share List . . . 96
Current Sales of Gas Products . . . 98
Coal Trade Reports . . . 98
PARAGRAPHS:—
PERSONAL: Mr. R. Silcox; Mr. H. B. Heath; Mr. G. R. Love, Assoc.M.Inst.C.E.; Mr. Edward Hargreaves; Mr. Thomas H. Clare; Mr. Herbert Gandon; Mr. Walter Donaldson; Mr. Joseph Speakman; Mr. R. A. Browning, Assoc.M.Inst.C.E.; Mr. John Gibson Newbigging, Assoc.M.Inst.C.E. . . . 83
OBITUARY: Mrs. Georgiana Laming; Mr. Thomas Trewhitt . . 83
The "Powers of Charge" of the Metropolitan Gas Companies . 75
The Revenue from the Supply of Artificial Light—Expiring Patents—A Gas and Electric Light Combination in New York . . . 76
The Production of Calcium Carbide . . . 83
South Staffordshire Water Company's Supply . . . 88
The Bagshot Gas-Works in the Market—Additional Storage at the St. Anne's Gas-Works—Windsor Corporation Water Accounts—Dorking Water Company and the Local Authorities . . . 99
Hastings Water Supply—Bolton Corporation Water-Works—Ilfracombe Water Scheme—The Lighting, Water Supply, and Sanitation of Colombo—The Proposed Purchase of the Cambridge Water-Works—The Progress of the Mourne Mountain Water Scheme for Belfast—Exmouth Water-Works . . . 100
Increase in the Price of Gas at Cinderford—Settlement of Compensation Cases at Manchester—Installation of Water-Gas Plant at the River Plate Gas Company's Works—Gas Workers' Wages at Salford—Estimating the Value of Water-Works—Public Lamps and Sewerage Operations—A Practical Gas-Fitting Class at the Birmingham Technical School—Bilston Gas Company—Prospective Extension of the Leeds Gas-Works . . . 101
Increases in the Price of Gas—Curtailment of the Public Lighting at Sheffield—Sulphate of Ammonia and Nitrate of Soda in the Past Year—Birkdale again Complains of the Quality of the Gas Supply—The Great Malvern District Council and the Link Gas-Works—Protecting the Leeds Water Supply—The Water Undertaking of the Dover Corporation—Manchester Water Supply—Kidderminster Water-Works—Price of Gas at Llanelly . . . 102
Mid-Kent Water Company—Oldbury Gas-Works—Southampton Water Supply . . . 103

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EDITORIAL NOTES.

The London Gas Settlement.

IN the last issue of the "JOURNAL," we gave a brief account of the state of the New York gas supply, as brought about by the system of competition in the business in which the town communities of the United States still believe. Instructed opinion in this country, and generally throughout the Eastern Hemisphere, differs from American judgment in this matter, for what are regarded as good and sufficient reasons. We "on this side" hold that competition in trade must be judged as merely a means to an end—the end being the supply of the article of commerce, whatever it is, to the public at the cheapest price, and with the highest attainable efficiency. Not all trades or public services are suitable for competitive operation. Every case must be treated on its own merits. Political economists, constantly in search of the rules or "laws" that govern the trading operations of the world, have made a close connection between the freedom of competition and the mobility of trading capital. They remark that, in the same degree that the capital necessary for carrying on a particular undertaking has to be immobilized, or sunk without the possibility of recovery, so far must it be protected from injurious competition. Besides, the question is really as broad as it is long. If capital has to be sunk in a business which is remunerative enough, but is not protected from competition, then the capital will get protection for itself by the setting apart of an adequate provision out of its earnings for redemption, or as a "war chest," or something similar.

Hence we argue that the existence of competition, potential or actual, in the American gas business, is of necessity so dealt with by Gas Companies as to defeat the object which the public fondly believe it secures. The laws will not promise the Companies protection from disturbance during good behaviour, in return for which the capital so protected would accept a reasonable rate of remuneration; and consequently the Companies take care of themselves. The European concession system is the reverse of this; but it is so inelastic, and at variance with Free Trade views of economics, that it can only maintain its vogue in Protectionist countries. There is no need to discuss this system at the present juncture. There is, on the other hand, every justification for reviewing in all possible lights the British, and especially the Metropolitan, principles of gas supply, because they are going into the parliamentary melting-pot, and nobody knows what, if anything, will come out of it before all is done.

The cardinal feature of modern British Gas Companies' statutory and financial condition is the sliding-scale; and the important thing in the sliding-scale is the standard price. There may be several views of the true character of this settlement. One is that when the Company have once had a standard price assigned to them, they are free to take the fullest advantage of it in the way of distributing the utmost increased dividend that the actual selling price of their gas allows—indeed, that they are legally required to do so. Another view is that, in fixing a standard price, Parliament does not intend it to be the last word of regulation of the Company's finances. According to this view, a standard price may, at some time or other, be revised like any other enactment, if found to be unfair, or not to the public advantage in any way. It cannot be denied that the latter view has gained strength of late. Indeed, support for it has been discovered by the Powers of Charge Committee of last session; and those who desire further instruction in the history of the subject may be commended to the little book of Mr. Laurence W. S. Rostron, just published, with the advantage of a preface by Mr. George Livesey. We mention this useful work here, for the sake of the remarkable admission made by Mr. Livesey in the preface, that henceforward when a sliding-scale Gas Company go to Parliament, under a certain condition "a "reduction of the initial price may be expected."

Hitherto, as Mr. Livesey observes, although a Parliamentary Committee could never be induced to say that the initial or standard price ought never to be reduced, as a matter of fact this had not been done; and the learned and astute gentlemen on the public side of the Committee tables practically treated the standard as a fixture. Yet they were all reckoning without their host; and were one and all shutting their eyes to every other consideration except the financial one—that to alter the standard price

would be a breach of faith with the investors who had bought the Company's stock on this basis. But there were disturbing elements in the case which, although ignored and suppressed, could not be got rid of; and these factors have now asserted themselves with a force that must be respected and reckoned with. One was the uncomfortable knowledge that, whereas in some instances the standard price had by an accident been fixed so high that the owners dared not take the full benefit of it, in no case was it so low that the Company had any reason for complaining. Obviously, if the inducement to purchasers of new stock issues under the sliding-scale was the controlling consideration, the actual amount of the standard price was immaterial. But it was not really so. An excessively high standard price meant that the bulk of old stockholders had the power of voting themselves dividends far beyond anything they either expected or deserved. The institution of the sliding-scale was never intended to give 10 per cent. stockholders the privilege of dividing 15 per cent. and upwards; and every instance of the kind was a peril to the whole system. Where such a condition of things prevailed, the complete purpose of the settlement was defeated. Every Company that dared not divide their profits "up to "the hilt" according to their sliding-scale, confessed an excess, and invited revision; and every Company that divided too much, albeit within the legal limits, challenged attention to the circumstances. There is no fixed standard of "sweet reasonableness" in this matter.

It seems to emerge from all the considerations pertinent to the question of the settlement of gas supply on a sliding-scale, that "the proof of the pudding is in the eating." It is the essential nature of sliding-scales to be of limited operation. The margin within which they act is narrowed by every move in the two opposite directions, until it disappears. When this consummation is arrived at in the case of a Gas Company, the public will exclaim "Ah! "If the dividend had not started quite so high up, the "price would have gone lower." Then what is to be done? Alter the law—or bear the consequences of a mistaken valuation for ever? One need not be a prophet to perceive which course is likely to prove the line of least parliamentary resistance.

Points of Prospective Gas Legislation.

In the programme of Gas Legislation for the coming session, as sketched in the numerous Bills which we have abstracted according to annual custom, several interesting points rise into prominence. We have already discussed the proposals actually formulated for a partial resettlement of the London Gas Supply, and need not now return to these suggestions. It is worthy of notice that the gas problem of Bradford is being attacked by the Corporation on a simpler preamble than that previously formulated. Last year the favoured plan involved the partition of several outlying gas undertakings. But the hopelessness of effecting this operation equitably has been accepted; and consequently some of the undertakings are to be bought outright. In a single case, the Bradford Corporation propose to buy gas in bulk from a border Gas Company, to sell within the city. It is a curious situation altogether. We are not surprised that the scandal of extravagantly elaborate and costly arbitrations for ascertaining the transfer value of small gas undertakings, on which we animadverted in the "Journal" for the 5th ult. (see p. 1367), has been effectually prevented by the terms of the Glastonbury and Lymington Corporations Bills. Every credit is due to the framers of these measures for the common-sense way in which they have risen to the occasion. The Glastonbury Bill, moreover, is not an agreed Bill; the Company having a Bill of their own for giving them a new lease of life. Still, the leading fact is that the Company have a capital of £10,000; and the Corporation are willing to buy the property at a fair valuation, taking due care of officers and servants. But the arbitration is to be conducted by a single arbitrator; and neither party is to be represented by more than one Counsel and two expert witnesses. Quite enough, too! It is more than ridiculous for all Great George Street and a couple of Inns of Court to be engaged for days in pretending to instruct three men, who know all about it, whether this or that item of £20 a year should be capitalized as a permanent asset. In the Lymington case, the arbitration is already an agreed thing. The parties are both well meaning and businesslike about it. All they desire is to strike a fair and reasonable bargain; and so they choose their arbitrators, who are empowered to get an umpire in case of disagreement, and the valuation is to be arrived at without the assistance of Counsel or expert witnesses at all. Prodigious! Consultants and Counsel have "pulled the string" too often and too hard; and people are now learning to do without them. It is a happy augury that both Glastonbury and Lymington are advised by men who are wise enough to take the warning that our pages have so often given.

A Further Shortening of the Labour Supply.

War, famine, and pestilence were the three great factors upon which philosophers formerly relied for preventing what to them appeared a very great calamity—any considerable increase in the population of these islands. That population has steadily advanced until it has reached dimensions, and created problems, undreamt by those philosophers, without however as yet involving the country in ruin. In fact, the boot is at present on the other leg; for, in spite of that great increase in population, the commercial community is just now, by reason of two of the three factors named, suffering from a too limited supply of labour. That shortage is not, however, fortunately likely to be of the permanent character of the reduction in population contemplated by the "economists" of former times. They looked to war and pestilence to kill off, from time to time, some of the surplus population. The country is suffering from both these evils at the present moment; and the labour market is thereby considerably deranged. But, with the exception of what will, in comparison with the bulk of the industrial population, be the very small—though absolutely all too large—number of workers killed or permanently incapacitated in the course of the campaign in South Africa, the large majority of those at present withdrawn from the service of our industries will, in course of time, return to their former duties.

Reference has been previously made to the effect of the war upon the labour market. A further dislocating cause is now making itself widely felt, and is seriously inconveniencing many business concerns, the cause which we have—with somewhat of exaggeration, perhaps—designated as "pestilence." Reference, of course, is here made to the severe epidemic of influenza which is hitting right and left throughout the country. Some industries (if not all) have been severely hit, and not least the gas undertakings. We hear on every hand of companies with a large percentage both of their staff and of their hands on the sick-list—a misfortune always inconvenient, but at the present time peculiarly so. In regard to the staff, this is just the period at which they are particularly busy, closing the books and preparing the accounts for the six months that have just ended; while so far as hands are concerned, since managers have already—owing to the activity of trade and the demands of the war—experienced difficulty in obtaining their winter hands, of whom they have required a full supply to enable them to cope with the increased demand for gas, any considerable, if only temporary, disabling of men must be most vexatious.

That the epidemic is widespread in its effects is seen—if, indeed, any of our readers need proof of it—from the fact that about 7000 members of the Hearts of Oak Benefit Society are reported to be suffering from influenza; while the deaths therefrom in the last week of 1899 were nearly 200 (or nearly eight times the normal) in the Metropolis alone, sending up the total death-rate to over 35 per 1000. As to its causes, its prevention, its cure, and how the infection is conveyed, the medical profession at present appear to possess an extensive ignorance. It is cheering for the journalistic profession to know that the present epidemic appears to have a partiality for brain-workers, and very generally attacks the nerves. However, let us hope that, as the epidemic is sharp, so it may also be short. Just now, what with scarcity of coal, shortness of labour, and dearness of materials, the gas manager's lot is not a happy one.

Compensation and Wages Questions at Manchester.

As will be seen by the report which appears elsewhere, attention was given at the meeting of the Manchester City Council last Wednesday to several matters of great importance relating to the Gas Department. The recommendations of the Committee to grant the sum of £5000, in a 3 per cent. mortgage of the city rate, for the benefit of Mrs. Stevenson and her family, commended itself to the

unanimous opinion of the Council, and will, we believe, be heartily approved by the citizens generally. A feeble attempt was made to show that greater generosity was displayed in this case than in that of an ordinary workman who was compelled to go to a lawyer to enforce his claims. This charge was disposed of by Mr. Alderman Gibson, the Chairman of the Gas Committee, in his vigorous speech. It is a fact, however, that sometimes recourse is had to a lawyer before application is made to anybody else; and hence such claims are said to be settled on the "legal basis." One case was specially referred to by the Chairman, in which a man was said by his own lawyer to be a "fool" for not accepting the offer of the Committee. The decision of the Committee to grant an advance of 5 per cent. on the wages of all workmen in the Gas Department, and time-and-a-half for an additional shift on Sundays, must give great satisfaction to all concerned. Alderman Gibson was careful to explain to the representatives of the men who waited upon him, and also to the Council, that these concessions had been granted not because the Gas Workers' Union had made certain demands in the interests of their own members, but because they were just and right, and extended to all workers, whether they were members of the Union or not; and they would have been granted just as readily if the men themselves had applied. It was said at the Council meeting that a responsible official of the Gas Committee had intimidated members of the Union. This has been shown to be incorrect; and if any intimidation has been attempted, it has been on the part of the Union men towards the Manager. The concessions to the workmen will increase the Corporation wages bill by about £6000 a year.

The Strikes and Lock-Outs of 1898.

SOME notice, even in these preoccupied times, has been bestowed upon the report by the Chief Labour Correspondent of the Board of Trade on the "Strikes and "Lock-Outs of 1898." This return is somewhat belated, and does not encourage the belief that the staff of old Trade Union officials who man the "Labour Department" of the Board of Trade are overworked, although the majority of them take a good deal more than the Trade Union rate of wages. It begins to dawn upon the industrial world that we got on very well before all these workpeople's squabbles were made into statistical hashes of doubtful nutritive value, at considerable cost to the country. The statistical method is all very well, so far as it goes and is applicable to the subject-matter; but it is open to doubt whether strikes and lock-outs are fairly amenable to this treatment. Thus, of the total aggregate duration of disputes for the year, which is stated at 15 million days, no less than 11½ million days were accounted for by the then South Wales colliers' strike. Why this suspension of work should be lumped in with a handful of tailors' disputes, is not apparent. It is possible, of course, to multiply the number of dishes on a dining-table by the gas-burners in use in the room, as a means of arriving at the gorgeousness of the feast; but the practice is not usual. If these returns show anything at all, it is that the cultivation of strike management as a profession has fallen upon evil days. Failing the command of the strike funds—which, unfortunately, in the South Wales case were non-existent—the professionals turned their attention to the task of "negotiation." The Department graciously magnifies their performance in this way by entering, in the same line, those disputes which were settled directly between the parties themselves "and their agents." The latter are the gentlemen who "intervened"—much better word than "interfered"—and helped to square the matter up. The report gives a dry account of the Welsh coal trade dispute. This would be registered in the tables as one dispute; but it scores heavily, in numbers of men and duration, among those terminated in favour of employers. The Department must hurry up its reports, if they are not to be passed over as ancient history.

A Curious Side of the Workmen's Compensation Act.

NOTWITHSTANDING all the pressure which will doubtless be brought upon them by friends and enemies of the Workmen's Compensation Act, it is greatly to be hoped that the present Government will hold their hands from any extension of the law on the same lines, at least until the last session of this House of Commons. Indeed, we are not sure that better speed would not be made if the rounding off of the law were still further postponed. The reason is that several years must pass before the true bearings of the law declare themselves. We do not speak now of the puzzles that continually arise as to the application of the Act to this or that employment, or any mere questions of interpretation or limitation. The gravity of issues of this kind to the several parties concerned must not obscure their essentially transient character. It is the permanent elements that count; and these are only slowly shaping themselves. For example, one of the greatest of the changes effected by the Act was the substitution of a totally new basis for the calculation of compensation for injuries for anything that had previously been recognized in industrial law. For the first time, the consideration of the extent of a man's responsibilities to his kindred and dependents was made to affect his claim upon his employment. We are scarcely beginning to see what this may mean. Only the other day, it was seriously pleaded that the compensation to a man for the loss of an arm should be reduced by the consideration that since the accident the man had married a widow who kept a public-house, and had consequently suffered no pecuniary damage at all! This is nothing to laugh at; but it goes to show that the recognition of consequential injury by the Act may work out into curious results that need time for their full development.

Government and the Housing Problem.

RATEPAYERS should be forearmed against the threatened new development of Progressivism, of which warning is being given in different quarters. This is no other than the proposal to buy land outside the towns, and erect municipal settlements as a means of relieving the congestion of the population in the central regions. We noticed a short time ago that the politicians of the National Liberal Federation had no time for consulting over the problem of the housing of the working classes; but it now appears that this is not to prevent them trying to make party capital out of the question by moving an amendment to the Queen's Speech, if the Government does not "satisfactorily" deal with the matter. So the "Codlin "not Short" business is already in the air. The inconsistency of A attacking B for not doing something that A has never troubled himself about, is nothing in political circles. In the meantime, Lord Salisbury has, it seems, admitted "the grave importance of providing cheaper "and better houses, and in far greater numbers, than "has hitherto been done, to meet the still rapidly "growing demand of working men in London for suitabl "dwellings within a reasonable distance of the localities "in which they are obliged to work." And not in London only. Mr. Ritchie, the President of the Board of Trade, has expressed his regret that Local Authorities throughout the country have so far made little use of the powers in this regard conferred upon them by the Act of 1890. He is of opinion that had such bodies utilized to the best advantage the powers then given them, much more than has been effected might have been done to avoid the present congestion of our great cities. Here we have an example of the uselessness of legislating in advance of public opinion. The Municipalities were so bent upon going into trade, that they could not see their duty in other matters towards the people committed to their care. It is high time the Local Authorities set themselves, literally, to the task of putting their houses in order. What is wanted is, in the first place, agreement as to the lines on which real progress in this direction can be made; and next the force of public opinion to make the advance effective.

The "Powers of Charge" of the Metropolitan Gas Companies.—In view of the widespread interest aroused by the report of the Select Committee of the House of Commons on the "Powers of Charge of Metropolitan Gas Companies," taken in conjunction with the alteration by the House of Lords of the standard price of the Lea Bridge Gas Company, a history of the sliding-scale settlement of the London Gas Supply has been written by Mr. Laurence W. S. Rostron, M.A., B.C.L., Barrister-at-Law, to which Mr. George Livesey has written a preface. Seeing that Mr. Livesey is one of the few surviving actors in the great movement that led to the establishment of this rule in gas supply, his co-operation with Mr. Rostron in recording the history of the transaction is of inestimable service to the cause of historical truth. Mr. Rostron has spared no pains in setting out the law and its origin, from the stormy times of London gas competition downward. The book is published at the office of the "JOURNAL."

WATER AND SANITARY AFFAIRS.

THE importance of the River Lea as a source of water supply for the Metropolis invests with more than ordinary interest the Bill promoted by the Conservancy Board for that river to obtain parliamentary sanction to their reconstitution. Seeing that the Lea furnished about 22 per cent. of the water consumed in London in 1898, it is in the highest degree necessary that its guardians should keep strict watch over it, so as, on the one hand, to prevent its waters from being drawn upon unduly, and, on the other—a far more serious matter—to preserve them from pollution. We are not aware that the Board have ever laid themselves open to the charge of neglecting their duty in either respect. As at present constituted, the Board has five representatives from landowners, one from barge owners, one from a group of Local Authorities, one each from the City Corporation and the London County Council, and two each from the New River and East London Water Companies. This arrangement has for some years failed to satisfy the County Council, who on two occasions—in 1890 and 1893—made unsuccessful attempts to induce Parliament to alter it. In each case they gained the ear of the House of Commons, but failed to convince the Upper House of the necessity for a change. Undaunted, however, they slipped into a General Powers Bill promoted last year provisions for the dissolution and reconstitution of the Board in accordance with their notions of proper representation —that is to say, their authority was to be greatly enlarged, and that of the Water Companies considerably restricted. Under their scheme, the five County Authorities of Bedfordshire, Essex, Hertfordshire, Middlesex, and West Ham were each to send one member, London was to be represented by seven, the Corporation by one, and the two Water Companies by one—making altogether fourteen (one more than the present Board), and excluding altogether the land and barge owners' representatives. The Council urged that the principle of county representation was the proper one to follow for river conservancy, and that local representation had been adopted before county government was reformed. They thought that, as six Water Companies were represented by a single member on the Thames Conservancy Board, one would be ample to protect the two Companies concerned in the River Lea, wherever their interests differed from those of the consumers, represented by the counties. They justified their exclusion of the land and barge owners on the ground that their interests would be looked after by the county members. When the Bill containing this scheme was about to be read a second time, an undertaking was given on behalf of the Conservancy that they would promote a Bill in the next or succeeding session to reconstitute the Board; and they have fulfilled their promise.

The proposals for the reconstitution of the Board which have been embodied in the Bill deposited for next session are of a rather more liberal character, as far as representation goes, to the two Water Companies than were those of the County Council. The number of members is still to be thirteen; but the Council will only send two; while the Councils of Essex, Hertfordshire, and Middlesex, the Corporations of London and West Ham, and the two Water Companies will be represented by one each. There are to be four elected members—one each by the Local Authorities and riparian owners in what are called the upper, middle, and lower districts, and one by the barge-owners. This seems to us to be a better distribution of the representation than that proposed by the Council. Even supposing they were justified in reducing the number of the Water Companies' members by three, which we do not admit, surely the interests of the land and barge owners were large enough to justify direct representation. While curtailing the Companies' voting powers, their contributions to the funds of the Conservancy are to be increased, without any additional privileges being granted. If the Bill passes, the aggregate annual sum payable to the Board by the Companies under the River Lea Water Act of 1855 will be increased to £8000, of which £3750 will be paid by the New River Company and £4250 by the East London Company; and the yearly amount payable under the Lea Conservancy Act of 1868 will be increased to £2000. The Bill, it need scarcely be said, contains a clause prohibiting the throwing of ballast, &c., overboard. Anyone guilty of offending in this way, or of suffering waste products to pass into the river, or heaps of manure, gas lime, town sweepings, or refuse matter of any kind, to remain for more than two days in such a position as to be likely to drain or be blown into the stream, will be liable to a penalty not exceeding £20, and to a continuing penalty not exceeding £10 a day. Stringent measures of this character are, of course, necessary to keep the river as clear as possible.

The question of the water supply of Southampton seems fated to be a source of trouble and dissension in the Town Council and of expense to the ratepayers. In successive sessions of Parliament the Corporation have made abortive attempts to acquire the undertaking of the South Hants Water Company; last year's expenditure on this object amounting to rather more than £4000. Failing in their attempts to obtain possession of the Company's works, they thought they would endeavour to improve their own by taking steps to secure their sources of supply from possible contamination. Their Water Engineer, Mr. W. Matthews, advised the acquisition for this purpose of certain lands at Otterbourne, where the works are situated; and he had to back him up no less an authority than Mr. W. Whitaker, whose opinion was sought on the matter. This distinguished geologist had, in the course of an address to the Sanitary Institute, suggested that "round each works for the supply of water a certain "tract of the water-bearing bed should be saved from the "assaults of surface contamination;" and therefore it was only consistent for him to support Mr. Matthews. In his report to the Parliamentary Committee of the Corporation, he pointed out that this protection had been applied in the case of gravitation supplies, and to a slight extent where water was taken from springs; but he confessed that he could not remember any instance where a well supply, such as that at Otterbourne, had been protected by the acquisition of a considerable area of land round the well. He thought, however, in view of the possibility of some such protective measures as these being insisted upon by the Local Government Board, that the Corporation would be displaying wisdom by putting themselves in the position of being able to stop any proceeding which might appear to have any risk of detrimentally affecting the water supply within a considerable distance of their works. Looking to the future, he regarded the scheme as a good one. The quantity of land proposed to be acquired was 178½ acres, which was 72½ acres less than was originally proposed; and a Bill was prepared on this basis for next session. But when it was submitted to the Council for approval last Wednesday, it encountered very strong opposition. The opinion of the majority of the speakers was that the suggested expenditure was not called for, inasmuch as the purchase of the land was not stated to be absolutely necessary. As the supply was drawn from the chalk, the danger of contamination was characterized as a "bogey," and the scheme generally as "suicidal;" and it was thought that the ratepayers were already burdened heavily enough with a rate of 8s. 7d. in the pound, without incurring further expenditure on "expen-"sive fads." In view of these strong expressions, it is not surprising to find that the scheme was rejected by a large majority. There will consequently be no parliamentary expenditure on water supply this year by Southampton; but time will show whether or not the Corporation have been "penny wise and pound foolish" in declining to adopt suggestions of their Water Engineer and skilled adviser.

The Revenue from the Supply of Artificial Light.—The annual revenue from the sale of gas is estimated to be about £20,500,000; that from the sale of petroleum, about £4,500,000; while that accruing from electric supply during the past year may be expected, according to the "Electrician," to attain nearly £2,000,000.

Patents Expiring in the Present Year.—Among the patents which will expire in the present year are Nos. 3592, 8157, and 9806 of 1886. The first and third, dated March 13 and July 29, were taken out by Dr. Welsbach for "illuminant appliances for gas-burners" and "incandescent mantles, &c.;" and the second was taken out by Mr. F. Siemens on June 19, for "regenerative gas-retort furnaces."

A Gas and Electric Light Combination in New York.—According to a telegram received last Wedesday from the New York Correspondent of the "Yorkshire Post," the Consolidated Gas Company have absorbed the Electric Lighting and Heating Company. This step will, he says, convert the Consolidated into the most powerful illuminating company in New York, and "put it in a position to make a strenuous attempt to unite all the gas and electric light companies in the city."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 96.)

In Capel Court the "Happy New Year" opened on Tuesday a little more happily than the old year had closed; but fluctuations rapidly set in, and so quickly did the changes work that the tendency varied from day to day. This seems to have arisen from there being several conflicting factors at work pulling different ways; and so things were see-sawed up and down. The most potent influence was in the Money Market, which underwent a complete transformation; but against this came the Local Loans issue. Then the Joint Stock Bank returns were exhilarating; but depression was caused by heavy sales on German account. And meanwhile war news was almost *nil*. So altogether it was a rather distracted week. Money is so abundant, and discount rates have eased down so remarkably, that hopes of a reduction in the Bank of England rate at no distant date are being entertained. In the Gas Market, business had quite a revival (and it was time enough, too) after a long period of depression; but although transactions were numerous, operations were for the most part confined to the leading issues. Prices kept nearly at a dead level; and hardly a quotation of importance had a change. But such as they were, the changes were all in the upward direction. In Gaslight issues, the ordinary had quite a brisk time, and made several attempts to top the quotation, but could not quite manage it. The secured issues were a good deal left alone, and made no particular sign. South Metropolitan displayed more activity, and were steady. There were a few dealings in Commercial, but prices were not higher. One single bargain was all that was marked in the Suburban and Provincial group. Sheffield is locally quoted at a rise of two points; but none of the rest made a sign. Among the Continental Companies, nothing was noticeable except Imperial, which was a good bit dealt in, but at figures which were much disposed to shrink, though no actual fall took place. Of the remoter undertakings, Buenos Ayres and River Plate effected a recovery. The Water Companies exhibited their usual placidity; but they showed a disposition to mend in sympathy with the easier condition of the Money Market, just as they had fallen in response to its hardening.

The daily operations were: Gas opened firm on Tuesday, and prices were good; but quotations did not move. In Water, Lambeth advanced 2; but Southwark ordinary was 1 lower. Business in Gas was a little quieter on Wednesday. Buenos Ayres and River Plate went up ¼ each. In Water, Chelsea preference gained 5. Thursday was moderately brisk; and quotations were not moved. Friday was the busiest day, especially for Gaslight ordinary and South Metropolitan. Buenos Ayres rose ¼. Saturday was about as active as usual; and quotations closed without further variation.

ELECTRIC LIGHTING MEMORANDA.

A Criticism of the "Memoranda"—Return to the Charge—Sparing the Capital—The Sad Case of the Metropolitan Company.

The attention paid by our Electrical Contemporaries to these "Memoranda" is very gratifying, having regard to their character and purpose. We glory in exhibiting the "seamy side" of electrical business, and endeavour not to miss an opening for directing attention to the drawbacks and shortcomings of electrical enterprises. This being our propensity, which is indulged week by week—now at the expense of the Shoreditch affair, or with reference to the failure of electricians to cure the unreliability of their light, or something equally painful—our readers may rest assured that the electrical journals are not likely to spare us if they can catch us tripping. A proof of this is furnished by the gleeful way in which the "Electrician" of this week pounces upon a remark appearing in this column respecting the lack of connection between the economical working of electricity generating stations and the prevention of risk of interruption of the service. We demanded, what is coal saving, or anything else, to a man who cannot get a light when or where he wants it? And to this our esteemed contemporary rejoins, "As if, forsooth, economy necessarily implied risk of breakdown." The contention is contemptuously dismissed as "an amazing *non sequitur*."

Well, although there is an infinity of contempt in this "forsooth;" and notwithstanding the dread we feel of a *non sequitur*, which is indeed a "fearful wild fowl," we must keep the same opinion still. We did not, and do not, say economy of electrical works design or management necessarily implies risk of breakdown; but we certainly do hold that the obligation upon central station designers and managers to "cut it fine" in both capital outlay on spare or relief plant, and in the running expenses, distinctly jeopardizes the reliability of the service. The "Electrician," with a too obvious desire to lead its public off the scent, professes ability to well understand the alarm of its gas friends "at the close attention electrical engineers are paying to high economy, and at the excellent results this careful attention is producing." There is plenty of room for all the saving that electric lighting engineers can effect in the planning and working of central stations, before they can get level with the despised gas manager in this respect. At any rate, so thinks, and says, "the man from Sheffield," to whom we beg to refer the "Electrician" for very late information on this head.

This is the point—the obligation to eke out capital compels electricians to overrate the earning capacity of the plant they lay down in the first instance, and afterwards to take on more lamp connections than the station plant can safely supply. Is proof of this assertion wanted? It may be found in the valuable and only too big sheet table of electricity supply works in operation in the United Kingdom, sent out this week as a supplement to the "Electrician." It is not our task to frame a rule giving the margin of generating plant that a central station ought to have in reserve; but everybody knows the service provided by the City of London Company, for example, has not been quite satisfactory of late—not to put it more strongly. On looking up the entry relating to this undertaking in our contemporary's table, we observe that, while the total lamp connections number 425,000, the total plant capacity is 425,000 lamps also. With regard to saving of coal being against working with an adequate reserve, is it necessary to argue that driving steam plant at full load is more economical than having plenty of engine power in hand, and some boilers with banked fires? Besides, has it not been stated somewhere that reserve electric generating plant of the very latest and most improved kind is most difficult to work in to help the output on a pinch? How is this for the much-lauded three-phase system?

An important outcome of the heroic but ill-fated attempt of the Metropolitan Electric Supply Company to serve a lamp connection numbering 498,000 by means of plant only up to 144,000 lamps was the prosecution of the Company by the Vestry on the 29th ult., at the Marylebone Police Court, for having made default in the supply of the Vestry buildings and the Workhouse. It has not escaped observation that British philanthropy is liable to go astray in the matter of supplying the destitute with things that they do not need and are not thankful for. This case of lighting the Marylebone Workhouse by electricity seems to be an illustration in point, if it is not an attempt to realize Sir W. Preece's idea of the electric lamp being a poor man's light—at other people's expense. The Company pleaded guilty to the charge made against them, and threw themselves on the mercy of the Court. Their Counsel offered an extremely interesting, and not a little pathetic, explanation of the straits in which the Company found themselves when the dark days of last autumn set in. He did not add, as he might have done, that a conviction would come in very handily for the Vestry in depreciating the value of the Company's undertaking in the parish, which the Vestry are required to purchase before starting their own contemplated business in the same line. It is really a very untoward set of affairs altogether for the Company, who, if they have been rather greedy in booking new customers, are surely paying dearly for their offence.

A FRENCH REVIEW OF PHOTOMETRY.

The prospect that the whole subject of the purpose of, and the arrangements for, the statutory testing of the gas supply of London for illuminating power will be brought before Parliament during the ensuing session, lends fresh interest to the inaugural address of M. Vautier, the President of the Société Technique de l'Industrie du Gaz en France, which is given in full in the volume of the Society's "Transactions" just published. This masterly composition possesses all the charming clarity of expression and exquisite sense of style which one is accustomed to look for in French technical writings. The address deals with the legal, or regulation, photometry of England, Germany, and France; and, as the author remarks, the subject is one that had not been brought before the Société for a long time, during which important changes of practice have been made.

To signalize the nature of some of these modifications, the President plunges straightway into an account of the prescriptions of the London Gas Referees, contained in their latest Instructions. It is unnecessary to repeat these particulars. The description of the new Foucault photometer concludes with the remark that, apart from the mechanical differences between the appliances used, and the correction for temperature and atmospheric pressure, the determination of the illuminating power is made in England as in France, by the volume which must be consumed by the standard burner in order to obtain the same intensity as the standard of light employed; both the gas-burner and the standard of light being fixtures of the photometer. The fact is noticed that this was not always the method; and the older system is described in order to register the course of evolution in this regard. To go no further back than the Referees' Instructions dated September, 1896, it will be found that the illuminating power was the intensity given by the combustion in the standard burner of a fixed quantity of gas equal to 5 cubic feet per hour, corrected for temperature and pressure to 60° Fahr. and 30 inches.

This correction has been criticized by the Dutch Photometrical Committee;* for it is possible for the volume of gas to

* *See* "Journal," Vol. LXIV., p. 1161.

vary between 4·35 and 5·42 cubic feet, and it would be necessary to know the corresponding temperature and pressure at the test, and burn in the standard burner the volume of gas which, brought from these data to 60° Fahr. and 30 inches, would be equal to 5 cubic feet. Without this, the definition of the illuminating power rests upon the disputable hypothesis that the illuminating power of a flame is proportional to the consumption of gas. M. Vautier discusses the point in a note. He observes further that the Instructions of the Referees anterior to 1898 are open to other criticisms. First he criticizes the candle standard, next the Letheby and Evans photometers, and dismisses the whole outfit as imperfect. Fortunately, as he holds, they are all put out of date by the new Instructions, and possess merely an historical interest. He characterizes the new Instructions as realizing important improvements, among which are classed, for convenience of reference and comparison, the following salient features:—

1.—The standard of light is a part of the flame of a gaseous mixture flowing through a fixed aperture under a given pressure.

2.—Its intensity, tenfold that of the superseded standard, is more comparable with the intensity of usual sources of light.

3.—The standard gas-burner and the standard of light are placed at fixed and not very unequal distances from the disc of the photometer.

4.—The illuminating power is defined by the volume of gas under test, which must be consumed in the standard burner to equal on the screen the intensity of the standard of light (volume corrected to 60° Fahr. and 30 in. barometrical pressure).

So much for the English method. The German practice is taken by M. Vautier from the prescriptions of the Photometrical Committee of the German Gas and Water Managers' Association, which are official so far as the authority of the Association goes. That is to say, the scheme in question is only provisional, and does not necessarily correspond with the actual practice of any city of the German Empire. Where there is the opportunity for doing so, this is the method of photometry which the German Association would recommend for use. The standard gas-burner is the Elster argand, burning 150 litres per hour, with a chimney 210 mm. high, made by Schott, of Jena. It should be noted that there is no universal standard gas-burner accepted for German towns lit by concessionary companies. Divers test burners are in use besides the Elster argand already mentioned, as the Hohlkoff-Schnitt flat-flame burner, consuming 150 litres per hour; and also the Sugg "London" argand, No. 1. The illuminating power should be from 14 to 16 Hefners with flat-flame burners, and from 18 to 20 Hefners with argands, according to the terms stipulated. The photometer is that of Lummer and Brodhun; and the standard of light is the Hefner, which is a lamp certified by the Imperial Physico-Chemical Institute of Charlottenburg, burning acetate of amyl.

This is the simplest of light standards. It resembles in appearance a small common spirit-lamp, burning the combustible by means of a cotton wick in a flame 40 mm. high, or thereabouts. Extreme precision is unnecessary. The Berlin house of Kahlbaum undertakes the preparation of the amyl acetate, or pear oil, in a sufficiently pure state for photometrical purposes; and the Technical Institute of the Duchy of Baden, at Carlsruhe, supplies it in sealed litre bottles. It must be kept closely stoppered and in the dark, and must never be used for photometrical purposes after it has turned sour, as tested by blue litmus paper. The Hefner unit is slightly inferior in value to a German candle (union paraffin, burning with a 50 mm. flame, measured from origin to point). The following equivalents are given by M. Vautier:—

1 Hefner unit	= 0·83	German union paraffin candle.
" "	= 0·87	English standard candle.
1 German candle	= 1·20	Hefner units.
1 English "	= 1·14	" "

The Lummer and Brodhun photometer preferred in Germany offers remarkable advantages as regards sensitiveness, precision, and ease of application. As this photometer is not well known in France, M. Vautier describes it in detail. It is employed at the Central Electrical Laboratory of Paris, and is in regular use in the laboratories of the Lyons Faculty of Sciences. M. Vautier thinks its screen is more sensitive than any others of the bunsen type. The German Committee prescribe the following practice of gas photometry with this instrument: First, the standard gas-burner is to be regulated, after a quarter-of-an-hour from lighting-up, to consume the exact rated amount of gas. This must be done as carefully as possible, because no compensation for quantity is permissible. The hourly consumption is deduced from observations of the test meter for one minute. When the measurement is correct for two consecutive minutes, the adjustment is considered perfect. The Hefner unit is also lighted ten minutes before it is wanted; and its flame is then regulated to the proper height. Ten readings of the photometer constitute a test; the average being struck. It is not corrected for temperature or pressure; but the temperature of the photometer-room is maintained as nearly as may be at 17·5° Cent., with a tolerated margin of 5°. By whatever method determined, illuminating power of gas in Germany means the luminous intensity given by the hourly consumption prescribed for the standard burner—say, 150 litres per hour. This definition of illuminating power is the same as prevailed in England until the Referees made their change—exception made, of course, for the difference of the standard of light and the corrections.

French photometry is still exactly as Dumas and Regnault left it. M. Vautier takes this for an excellence; remarking that these illustrious *savants* succeeded the first time in devising a method and choosing apparatus answering so well to the industrial requirements that there has been no need to seek others. "They realized from the start, in their essential elements, that perfection which in other lands has only been approached by long and tedious endeavours." Complimentary all round. Yet it strikes one as remarkable that this supreme attainment should have been left a monopoly of the French, notwithstanding the fact that in 1860, when Dumas and Regnault laboured, the pre-eminence of French science was more widely accepted than it has been ever since. M. Vautier found it unnecessary to describe the details of the standard national method of photometry to his audience, contenting himself with registering the accepted order as being based on the use of a standard gas-burner (Bengel), and the carcel standard lamp, each placed at the same fixed distance of 1 metre from the screen of the Foucault pattern photometer. The equality of illumination of the screen is obtained by varying the volume of gas burnt at a pressure of from 1 to 2 mm.; and the illuminating power of the gas tested is stated in terms of the consumption per hour of the Bengel burner, without correction.

M. Vautier makes his memoir more complete by adding to it descriptions of all the known absolute and secondary standards of light. He describes the well-intentioned effort of M. Violle to produce an absolutely fixed standard of light by exposing a square centimetre of the surface of molten platinum at the point of solidification. But while admitting the desirability of such a means of standardizing and comparing among themselves the usual working, or secondary standards of light, he omits to show that this service has ever been done generally by means of the Violle standard. He does not say that he has ever seen it, much less worked with it. He speaks with another note of the working secondary standards, with which he is evidently familiar. Of the Hefner unit, he remarks that its illuminating power is very variable with the height of the flame, which, again, is very mobile. The slightest movement of the air makes it jump and tremble. It must be used in a closed apartment; and the operator must not move, speak, or breathe near it. The wind outside, or the slamming of a door in the same house, will unsettle it. Optical means are required to ascertain when the height of the flame is about the normal, in order to permit an observation to be made; and even then, an error of 1 or 1·5 per cent. in the luminous intensity of the standard is not rare. The humidity of the air, the proportion of carbonic acid present, climatic conditions, and many other influences affect the Hefner unit; so that measurements of the illuminating power of gas by its agency can vary by as much as 8 per cent. between winter and summer. The Charlottenburg Technical Institute, and the German Gas Association, have worked long and hard to make the national standard of light really serviceable. Dr. Bunte, at Carlsruhe, has done all that is possible in this regard; and keeps a stock of lamps and amyl acetate for distribution to other experimenters. Still, M. Vautier thinks the standard an imperfect one by reason of the impossibility of ensuring its reproduction with invariable value. It has been taken up in Germany because it is an improvement on the German standard candle. The makers and markers of electric incandescent lamps, we know, have jumped at it as a perfect Godsend—not, perhaps, altogether without regard for the circumstance of its being the poorest kind of "candle" known. With all the pomp and circumstance of an International Congress, the Continental electricians unanimously adopted the "decimal candle" as the unit of luminous intensity. In default of any actual candle corresponding to this hypothetical illuminant, the electricians proceeded to elect the Hefner unit as its representative, which arrangement, as the unit in question happened to be 13 per cent. or thereabouts less brilliant than the English parliamentary standard candle, suited them very well. Even as a secondary standard of light, the feebleness and redness of the Hefner light are grave objections to its use in industrial photometry.

M. Blondel has found the Hefner lamp so troublesome, on account of its vacillating flame and its dependence on a combustible not marketed in a pure form—which, moreover, has a boiling point so high as to provoke carbonization of the wick—that he has tried to improve it by substituting alcohobenzol for the amyl acetate. This preparation is a solution of 16 volumes of crystallizable benzine in 84 volumes of absolute alcohol, which gives a flame of about the correct Hefner value. The wick does not char; and the open flame is surmounted by a chimney of metal with glass shutters for the passage of the light. Here, again, a difference of 1 mm. in height of flame means a variation of 2 per cent. in the light. As M. Vautier remarks, all these standards of so feeble intensity are objectionable on this account alone, and also for many other reasons both scientific and practical. If it were impossible to get anything better, one would have to put up with them notwithstanding their inherent defects; but this is so plainly not the case that the wonder is why working photometrists should submit to be troubled with them.

M. Vautier has no reserve in his admiration for the carcel lamp, which has reigned over French photometry these forty years. He cites the authority of M. Crova for the statement that, even with two carcel lamps of very different make, the light will never differ more than 2 or 3 per cent. at the outside. This constancy is attributed to the fact of the lamp being on the old "Moderator" principle, with the oil regularly overflowing at the wick. He states that Violle constantly found the proportion of 2·08 between the platinum and carcel standards, which is wonderful agreement for what unkind sceptics would designate two variables. It is admitted, however, that to obtain such constancy of working it is necessary to follow exactly all the prescriptions indicated by Dumas and Regnault; and that it is doubtless because of want of this rigorous conformity to the instructions that foreigners, otherwise incontestably competent in photometry, have classified the carcel lamp as defective. This is hardly fair to the foreigner. What we have always understood to be the cardinal defect of the carcel lamp is not that it cannot be easily made to burn its 42 grammes of colza per hour and give its proper light in competent and honest hands, but that it can be so easily made or allowed to give a very poor light while consuming the rated quantity of oil, that the proof of the latter could not be successfully pleaded in a Court of Law as positive evidence that the lamp was working properly. And of other proof there is none. Whatever the defects of the candle standard, it was not open to this suspicion. If gas was found to show a bad test, the pieces of candle were there to speak for themselves; but nobody could swear to what the carcel lamp would do from one lighting to another.

M. Vautier runs through the well-known English standards, but has nothing to say of his own knowledge as to the merits of the accepted Harcourt ten-candle pentane standard. He makes the wise suggestion that the calorimetric testing of gas should be actively followed up. Surveying photometrical practice in the three countries named, M. Vautier compliments England and Germany on their progress in this respect; but he is not bold enough to more than hint at the possibility of improvement of the French practice. He admits, however, that the classical method of Dumas and Regnault answers in Paris and some other large French towns, because they allow a margin of 4 litres of gas to the carcel for errors of observation. Where, as in numerous instances, the margin is cut down to 1 litre per carcel, he admits that corrections for temperature and pressure might be worth making. Also, if a change were to be made, the Bengel burner might be found to be susceptible of improvement—after forty years! Meanwhile, French conservatism preserves the carcel lamp intact, although industrial as compared with legal photometry has little patience with it.

RECENT LITERATURE ON ACETYLENE.

We have received a small manual entitled "Hilfsbuch für Installationen von Acetylen-Beleuchtungsanlagen," by Herr Fr. Liebetanz (Leipsic, Oskar Leiner; 1900). It constitutes a compact and useful guide for persons called upon to deal with acetylene plant, as well as a compendium of information for fitters engaged on acetylene installations. The author writes for those unfamiliar with strictly technical terminology, and explains the properties of carbide and acetylene in simple language. The information given is, however, quite sound; and we are glad to see the dangers of acetylene are not minimized, though the precautions which in practice abolish all risk are fully set out.

Another handy pocket book, entitled "Taschenbuch für den Acetylen-Techniker," compiled by Dr. Anton Ludwig (Berlin, L. Toporski; 1900) has also reached us. It comprises a calendar for 1900, and a memorandum book, as well as a useful collection of data and tables for manufacturers, fitters, and users of acetylene plant. The special information on acetylene is sound. We think, however, that Dr. Ludwig scarcely does justice to the incandescent gas-light, when, in a comparative table of the cost of lighting by different means, he ascribes to it a duty equivalent to only about 14 candles per cubic foot of gas consumed. The comparison naturally is more unfavourable to coal gas in Germany than it would be in England; for the price of 4s. 6d. per 1000 cubic feet which is taken as the basis, is not unreasonable for that country, though it would be excessive here. Nevertheless coal gas comes out well in Dr. Ludwig's comparative table, which is much fairer than the majority of such tables put forward by advocates of acetylene.

We also note that the compiler classifies acetylene generators primarily into two classes, in place of the less rational classification into three classes which was formerly common. Even Professor Lewes, who at one time always made three primary classes of generators, has in his recent popular articles on "Acetylene Generators" in "Feilden's Magazine," adopted the simpler classification into two classes—viz. (1) those in which water is brought in contact with carbide, the carbide being in excess during the first portion of the operation; and (2) those in which the carbide is thrown into water, the amount of water present being in excess. We believe that it was Mr. W. J. A. Butterfield who first pointed out, in the course of a discussion on a paper by Professor Lewes (see "Journal," Vol. LXXI., p. 1380), that this was the only rational primary classification of generators; and his view is now finding acceptance.

GAS BILLS FOR 1900.

The following Bills promoted by Municipal Corporations and Local Authorities, relate in various ways to gas supply.

The Bradford Corporation Tramways, Gas, and Various Powers Bill is an awkwardly-named measure which contains a part concerned with gas, chiefly applying to dealings by the Corporation with the undertakings of the five neighbouring Gas Companies—namely, the Clayton, Allerton, and Thornton Company, the North Bierley Company, the Eccleshill and Bolton Company, the Airedale Company, and the Drighlington and Gildersome Company. These Companies supply gas to portions of the city of Bradford, at higher prices than the Corporation supply the greater portion of the district. The preamble states the desire of the Corporation to acquire the undertakings of the four first-named Companies, and to purchase gas from the last-named for supplying within the city and the parish and urban district of Hunsworth. Accordingly, the Bill proposes to empower the Corporation to require the Companies to sell their properties at three months' notice, given within a year from the passing of the Act. Among the other conditions of the absorption of these gas districts by the Corporation, is that of making the price of gas uniform within the city. A clause specifies the conditions and object with which the Corporation are to be empowered to supply the present Bradford district of the Drighlington and Gildersome Company with gas purchased from the Company in bulk at a price to be agreed upon or determined by a single arbitrator to be appointed by the Board of Trade. The mains and distributing plant of the Company in the district so supplied are to be purchased by the Corporation. Borrowing powers are desired for whatever amount of money may be necessary to carry out the provisions of this part of the Act, to be repayable in 50 years.

The Falkirk Corporation Gas and Burgh Extension Bill is to give powers for the acquisition of additional gas lands. The sum of £80,000 is to be borrowed for this and other gas purposes. Clause 20 runs as follows: "Any pipes or other fittings for the distribution or supply of gas by the Commissioners from any of their mains to any house or building within the limits for the supply of gas by the Commissioners, shall be made sufficient in workmanship and size and material so as to prevent the escape of gas, and to ensure a satisfactory supply of gas to any such house or building, all to the satisfaction of the Commissioners; and if any person requiring a supply of gas shall fail so to do, the Commissioners shall not be bound to furnish a supply of gas for such house or building."

The Glastonbury Corporation Gas Bill proposes to transfer the undertaking of the Glastonbury Gas and Coke Company, Limited, to the Corporation, at a valuation to be determined by arbitration under the Arbitration Act, 1889. Allowance is to be made for the plant being in excess of the requirements of the Company; and officers and servants are to be compensated. The arbitration is to be conducted by a single arbitrator to be agreed upon or named by the President of the Institution of Civil Engineers. Neither the Company nor the Corporation are to employ more than one Counsel and two expert witnesses. The maximum price of 15-candle gas is to be 4s. 6d. per 1000 cubic feet, tested on the works or at the Corporation offices. The Street Urban District Council are to have the option of purchasing their part of the undertaking. Notice of new gas-fittings intended to be covered up is to be given to the Corporation, who are to have the right of refusing to supply gas to unsuitable fittings, subject to appeal to a Court of Summary Jurisdiction. Besides the sum required to purchase the undertaking, £10,000 is to be borrowed for extending and improving the property. Surplus gas profits are to go to the district fund.

The Glyncorrwg Urban District Council Gas Bill is to give effect to an agreement arrived at by the Council and the Llynvi Valley Gas Company for the transfer to the Council of the portion of the undertaking and plant within their district, and generally to enable the Council to build gas-works and supply their district with gas. The sum of £3250 is the price agreed upon for the transferred portion of the Company's undertaking; and £8000 more is required to build new works and as working capital. The maximum price of 14-candle gas is to be 5s. per 1000 cubic feet. The rate of interest on consumers' deposits is to be 3 per cent. The gas loan is to be paid off in fifty years. Surplus gas profits are to go to the district fund.

The Lymington Corporation Gas and Electric Supply Bill is to empower the Corporation to take the supply of gas and electricity into their own hands. The local gas undertaking is called the Lymington Gas and Coke Company; and the proprietors have agreed to sell it to the Corporation at a price to be determined by an arbitration under the Lands Clauses Act, provided that no counsel or expert witnesses are to be employed by either side, but each party is pledged to give to the arbitrators such information as shall be required. This agreement is only to hold good in case Parliament passes the Bill. The gas limits are the borough of Lymington and the parishes of Boldre and Milford. The maximum price of 15-candle gas is to be 5s. 6d. per 1000 cubic feet. The rate of interest on consumers' deposits is 3 per cent. The sum of £10,500 is to be borrowed for gas-works extensions and improvement. Any surplus gas profits are to go to the district fund.

The Morecambe Urban District Council (Gas) Bill is to make

provision for the transfer of the undertaking of the Morecambe Gas and Light Company to the District Council, in accordance with the terms of an agreement which forms a schedule to the Bill. The promotion of the Bill is one of the points of this agreement. The measure contains the usual clauses authorizing the supply of gas by the Local Authority. The maximum price of 15-candle gas is to be 5s. per 1000 cubic feet. There is a clause as to the inspection of gas-fittings in new buildings. The sum of £50,000 is to be borrowed for gas-works extensions and improvement. The gas capital is to be repayable in fifty years. Surplus gas profits are to go to the district fund.

The Morley Corporation Bill contains a part relating to electricity and gas supply. The only reference to gas is in a clause authorizing the Corporation to refuse to supply where the applicant is in their debt for the same or any other premises.

The Newton and Llanllwchaian Urban District Gas Bill is to empower the District Council to supply gas and to purchase the undertaking of the local Gas Company. The Bill is promoted by virtue of an engagement to this effect in an Order of last year. The purchase price is to be determined by arbitration under the Lands Clauses Act, having regard to the actual cost only of the Order of 1899 and the compensation of displaced employees of the Company. Otherwise the Arbitrator is not to value the Company as a statutory undertaking. A clause is inserted protecting the Shropshire Union Railways and Canal Company. The maximum price of 15-candle gas is to be 4s. 7d. per 1000 cubic feet. Power of inspection of new fittings is desired, with liberty of appeal. The sum of £5000 is to be borrowed for gas-works extensions and improvement. Surplus profits are to go to the district fund.

The Ossett Corporation Gas Bill is to authorize the sale of the undertaking of the Ossett Gas Company to the Corporation; and to empower the Corporation to supply gas within the borough and certain adjacent places, all in the West Riding of York. The transfer is to be in consideration of a sum in gross determined upon the maximum statutory dividends of the undertaking, under the provisions of the Arbitration Act, 1889. The Corporation are to pay £400 towards the winding up expenses. The Manager and the Secretary, if of upwards of three years' service, are to be compensated for loss of office by a payment of two years' salary. The maximum price of 15-candle gas is to be 4s. per 1000 cubic feet. Consumers' deposits are to bear 3 per cent. interest; but prepaid accounts are to be credited with interest at the minimum rate of 4 per cent. Power is to be taken for the inspection of new gas-fittings intended to be covered up, subject to appeal. A clause permits the Council and the Horbury District Council to arrange for a mutual partition of the undertaking; the agreement providing that pending the conclusion of such an arrangement, a portion of the sinking fund shall be credited to the Horbury Council. Other neighbouring local authorities are to have the option of purchase. The sum of £25,000 is to be borrowed for gas-works extension and improvement. Surplus gas profits are to go to the district fund. The Corporation take power to make bye-laws with respect to the size and nature of consumers' gas-pipes, such bye-laws to be under the provisions of sections 182 to 185 of the Public Health Act, 1875. The form of deed of transfer of the undertaking of the Ossett Gas Company to the Corporation, given as a schedule to the Bill, is a model of conciseness of expression. It runs thus: "In pursuance and subject to the provisions of the Ossett Corporation Gas Act, 1900, and in consideration of £—— the Ossett Gas Company hereby grant, convey, and assign their undertaking unto the Mayor, Aldermen, and Burgesses of the borough of Ossett; to hold the same unto them their successors and assigns; and the said Mayor, Aldermen, and Burgesses do hereby accept the same accordingly. In witness whereof the parties hereto have hereunto affixed their respective common seals this—day of——19—."

A Bill of a special character is the measure intended to bear the short title of the "Metropolis Gas Act, 1900," but actually introduced with the heading "Gas Light and Coke, Commercial Gas, and South Metropolitan Gas Companies." This is the Bill the provisions of which were given very fully in last week's "JOURNAL" (p. 33). It is therefore unnecessary to reproduce the proposals here; and we only mention the Bill now for the sake of making our programme of prospective gas legislation for the coming session complete. The gravest clauses of the preamble relate to the statutory testing of London gas, which, it is declared, cannot be "satisfactorily or sufficiently" done at the prescribed testing-places; and to the rates of charge for prepaid supplies, which are asserted to be likely to defeat the statutory provisions regulating the price of gas. Part II. of the Bill proposes that any gas examiner may test gas at any time, anywhere, by means to be prescribed by the Referees. Notice of the intention to make such testings is to be given to the Company interested, specifying that the expedition will start from a certified testing-station at a particular time. "No person shall disclose to such Company, by such notice or otherwise, the place at which such tests are to be made." Prepayment meters are to be standardized, and also the fittings for use therewith; and the charge for them is to be fixed by the Board of Trade.

Mr. Julius Danckwerts, whose name has been frequently before our readers in connection with parliamentary and legal proceedings, has been made a Q.C.

DR. BUEB'S CYANIDE RECOVERY PROCESS.

LAST August we had occasion to comment on the interesting paper by Dr. Bueb dealing with the recovery of bye-products from coal gas, of which a translation was published at the time (see "JOURNAL," Vol. LXXIV., pp. 293, 308). It was pointed out that Dr. Bueb's process appeared to be virtually the same as that employed at Beckton, and as that devised by Rowland; and attention was incidentally called to the statements of a writer in the "Engineer" (see JOURNAL," Vol. LXIX, p. 895), who had asserted that the Beckton process was in many important particulars identical with that protected by Rowland. Probably the "Engineer" contributor had interpreted Rowland's specification in a very liberal spirit; and we do not propose to follow him in his attempt to prove the identity of Rowland's and the Beckton processes. Dr. Bueb, however, has taken exception to our remarks that his system closely resembles the Beckton process (see "JOURNAL," Vol. LXXIV., p. 769). We have compared the patent specifications filed by Rowland and Dr. Bueb respectively, and freely admit that the processes described in them differ in some essential points. If, therefore, the Beckton process is identical in many important particulars with Rowland's system—as the "Engineer" writer would have had us believe—clearly we must admit that Dr. Bueb's process is distinct from that used at Beckton. But if the Beckton process is not Rowland's—and we should, in common fairness, presume that it is not, for the Gaslight and Coke Company have, we understand, never paid a penny to the owners of Rowland's patent rights—then it is still conceivable that Dr. Bueb has but rediscovered what was known as to cyanogen recovery at Beckton even prior to 1895.

We say rediscovered advisedly; for we do not recollect having seen published a full account of the Beckton process. In his Presidential Address at the meeting of the Incorporated Institution of Gas Engineers in 1893, Mr. Methven gave an outline of the process (see "JOURNAL," Vol. LXI., p. 867); and his remarks on that occasion have probably been responsible for the prevalent impression that the Beckton system differs in only trifling particulars from Rowland's process. But Mr. Methven's remarks doubtless were intentionally vague, as the Gaslight and Coke Company did not wish to see other gas undertakings adopting the method, and by increased production spoiling the market for cyanides. Yet, even now, little more is generally known of the Beckton process than Mr. Methven divulged in 1893. But in the sequel, we hope to be able to show that it differs in certain respects from Rowland's process, and that the differences bring it into close analogy with Dr. Bueb's method. In doing this, we have not the slightest wish to detract from the merits of Dr. Bueb's invention; for we do not suppose that he had any special knowledge of the operations at Beckton. But it is right that the resemblances should be pointed out; and the way will then be open for Dr. Bueb or others to indicate the significance of whatever differences there are. We have been tempted to recur at this moment to the subject, by the publication in the "Journal für Gasbeleuchtung" of some further details of the practical working of Dr. Bueb's process, in the course of a paper by Dr. Scharrer, of Frankfort-on-the-Main. We will, however, first of all reproduce the more interesting portions of Dr. Scharrer's communication, which was originally presented to the annual meeting of the Mid-Rhenish Association of Gas and Water Engineers last year.

By the processes commonly in use hitherto for the recovery of cyanogen from coal gas, Dr. Scharrer says that the cyanogen was removed from the gas simultaneously with sulphuretted hydrogen, by means of the purifying material (oxide). But recovery of the whole of the cyanogen in the gas cannot thus be achieved; for only so much is recovered as the oxide converts into prussian blue. If the gas is imperfectly scrubbed, and ammonia passes forward in considerable quantity to the purifiers, the production of prussian blue is prevented, and the cyanogen becomes combined in the form of sulpho-cyanide, which is worthless. Moreover, a portion of the cyanogen in the gas has been removed in the condenser and scrubber, and is found in the gas liquor, also in the form of the objectionable sulpho-cyanide. Another portion of the cyanogen in the gas escapes absorption by the oxide, especially if the latter is all but spent. This portion is frequently by no means inconsiderable; and it is either taken up by the water in the gasholder tank, which is thereby rendered poisonous, or it corrodes the plates of the holder and the meter drum, and may even pass on and be consumed with the gas. The wet process is, Dr. Scharrer continues, far preferable to this dry process. It completely removes the cyanogen from the gas, which is thereby improved in respect of purity; and it gives a higher yield of cyanogen in a form which lends itself better to the working up of commercial cyanides. The wet process is very simple. The gas from which the tar has been extracted is washed with a concentrated solution of ferrous sulphate; and the ammonia is removed in the next operation. The cyanogen combines with a part of the ammonia present in the gas and with the ferrous salt, and forms therewith an insoluble double salt, which is deposited in the form of a thin sludge. It is desirable to modify the order in which the apparatus is set up, wherever the process is introduced.

Next to the atmospheric condenser, should come a Pelouze tar-extractor, which acts as well at from 85° to 105° Fahr. as at

ordinary temperatures. Following the tar-extractor, should come the cyanogen washer; after that a water condenser; and then the ordinary scrubbing plant. By this arrangement, cyanogen is recovered which would otherwise be lost. In works where a "Standard" or Ledig washer is already in use, its first compartments might be used for cyanogen recovery, and the remaining ones for the abstraction of ammonia. It is, however, preferable to use distinct cyanogen washers, the outlay on which will rapidly be recouped by the higher yield of cyanogen obtained.

The apparatus designed for the purpose resembles, according to Dr. Scharrer, a "Standard" washer of four compartments, with the agitators driven by steam power. On one side of the washer is the suction, and on the other the pressure connection, so that the absorbing liquid can be drawn or forced from one compartment to the next. Each compartment has a suction valve and a pressure valve. The suction side is connected with the tank in which the solution of iron is prepared and stored; while the pressure side is connected with a reservoir in which the cyanogen sludge produced is preserved until it is run off into barrels or tank-waggons. Cocks are fitted to each compartment, in order to afford a means of ascertaining if the compartment is full or empty. The washer needs but little attention—say, half an hour to an hour's time daily.

At starting, the fourth or outlet compartment only is half filled with the solution of iron, which in summer should have a specific gravity of about 1·133, but in winter should be more concentrated, having a specific gravity not above 1·15. After six or seven hours' working, the contents of the fourth compartment are pumped into the third, and the fourth compartment is filled afresh with solution of iron. After a further six or seven hours' working, the contents of the third compartment are pumped into the second, those of the fourth into the third, and the fourth is filled afresh. The same procedure is practised until all the compartments are charged. When the sludge in the first compartment is found by analysis to be saturated, it is pumped into the reservoir; and the contents of the posterior compartments are transferred to the next compartment, while the fourth is charged afresh. After about 350,000 cubic feet of gas have passed through the apparatus, the sludge in the first compartment is fit for pumping into the reservoir. The process abstracts from the gas cyanogen equivalent to 4 oz. to 6 oz. of yellow prussiate of potash, or to $2\frac{3}{4}$ oz. to 4 oz. of prussian blue, per 1000 cubic feet of gas dealt with.

Apart from this increased yield of cyanogen, the wet process has, in Dr. Scharrer's opinion, important indirect advantages. The removal of a portion of the ammonia from the gas by means of the cyanide washer, relieves the ordinary scrubbing plant, and the yield of ammonia is increased. Moreover, the oxide may be far more completely exhausted than hitherto in the removal of sulphuretted hydrogen from the gas, as it has only this—its proper—function to perform, and is not partially utilized in absorbing cyanogen and ammonia. The whole of the iron of the oxide is available for conversion to sulphide by the sulphuretted hydrogen, in place of a portion being combined with cyanogen. At gas-works in which the process has been in use for a year, the spent oxide has been found to contain over 50 per cent. of sulphur. This means that, compared with earlier results, the material has purified 30 per cent. more gas. Spent oxide containing over 50 per cent. of sulphur forms a good raw material for sulphuric acid manufacture, and is not worthless, as was the spent material hitherto produced. Purification can be effected simply with natural bog iron ore. Another advantage of the system is that the purified gas is entirely free from hydrocyanic acid, and does not therefore corrode meters and plates of holders. The process does not cause any reduction in the illuminating power of the gas.

Such is the account of Dr. Bueb's process given by Dr. Scharrer; and it must be confessed that from it one would say that the process was, so far as the account goes, identical with that used at Beckton. At Beckton, in 1893, a "Standard" washer was charged with a concentrated solution of sulphate of iron; and the gas issuing from the atmospheric condensers was led through this washer, and then passed on to a second "Standard" washer, which was devoted solely to the abstraction of ammonia. As Dr. Scharrer reports, it was found that the preliminary cyanogen washer relieved the work of the ammonia washer proper; and the filtrate from the sludge obtained in the cyanogen washer often contained as much as 6 per cent. of ammonia. The cyanogen, however, was not extracted by putting a solution of iron into the ordinary ammonia washer, but by means of an additional washer anterior to the latter. This has, we believe, been claimed as one essential difference between Rowland's process and the Beckton process; and Dr. Bueb, we notice (see "JOURNAL," Vol. LXXIV., p. 769), claims that his process differs essentially from Rowland's in precisely the same manner. The product of the Beckton cyanide washers was a sludge or mud, such as Dr. Bueb describes as the product of his system. On filtration, a liquor was obtained from it which was, as we have already said, rich in ammonia, but likewise contained ferrocyanide.

So far as we follow Dr. Bueb in the description of his process, we do not see that he avoids the production of such a liquor, rich in ammonia and ferrocyanide. He does not filter it off from the precipitate, but takes the sludge just as it is removed from the washer for working up to commercial products. Even so, the sludge was dealt with at Beckton, without preliminary filtration or separation of liquid from precipitate. We gladly admit that Dr. Bueb has set out in his recently issued patent specification (see "JOURNAL," Vol. LXXIII., p. 1370) the *rationale* of the process more clearly than any description of the Beckton system which has yet come to our notice; but then information concerning the Beckton process was purposely withheld from publication so long as a monopoly of its use was advantageous to the Gaslight and Coke Company. Changes have, however, occurred since this process was first adopted at Beckton, both in respect of the value of cyanogen products and the quantity produced from other sources; and no injury to the Company's interests ought now to be the result of a full disclosure of their practice in regard to cyanogen recovery.

We have said enough to show that the Gaslight and Coke Company's process follows very closely the procedure which Dr. Bueb has since devised; and we leave it to those directly concerned to point out substantial differences. There is scope for improved cyanogen recovery processes, notwithstanding the temporary lull in the demand for cyanides; and we hope that Dr. Bueb may yet be able to satisfy himself that his system is novel, and an improvement on those which have gone before.

THE DUTIES AND RESPONSIBILITIES OF AUDITORS.

PRESSURE on our space has prevented an earlier reply to an article on the above subject which appeared in the "Accountant" for the 16th ult., continuing what we have called—as our contemporary thinks, appropriately—our friendly discussion of the interesting question of an auditor's duties. Our contemporary is, as would naturally be expected of the journal of professional auditors, considerably exercised at our expression of the opinion that shareholders would be best advised to select for the post of auditor a man of good standing in the industry in which the company is engaged, preferably the accountant of another company. By what process of reasoning we arrive at such a conclusion, our contemporary is at a loss to perceive; and he asks what possible advantage could reasonably be expected from the change. Well, we should have thought that our line of reasoning was perfectly clear to anyone who had perused the various articles in which, during the past year, the subject of auditing has been dealt with. In considering the question of what qualifications auditors should possess—in addition to those of a certain holding in their company, and time to devote to the duties of the office—we expressed the opinion that the fundamental requirement of an auditor (over and above the foregoing, and in addition to the unimpeachable uprightness which is a *sine quâ non*) is a thorough and detailed knowledge of the whole system on which the accounts he has to audit are kept.

We then went on to express the fear that very few companies' auditors—and we were throughout speaking chiefly of the non-professional auditors elected by shareholders—even after many years' examination of the accounts in the accustomed fashion, much less at the time of their appointment, possess this most essential qualification, and to say that it is this primary deficiency in their equipment that gives to even such examination as they do undertake a superficial and unsatisfactory character. Our conclusion was that "only such men as have had years of experience of the system on which the books are kept of the particular (or analogous) classes of company they are called upon to audit, are really qualified for the work. The only possible alternative is the appointment of Chartered Accountants, who, by their training, are better qualified than other men to grasp the details of a business with which they have had no previous acquaintance. But unless the present system be materially amended, we decline to put any practical value upon the signature of any auditor, whether amateur or professional." The vital weakness of this system we had previously declared to lie in the unqualified reliance placed, at some stage or other in the process of auditing, upon the certificate of the very servants against whose possible dishonesty the whole purpose of auditing is directed. We have since given reasons for holding that the fact that the auditors of a company are Chartered Accountants is no sufficient guarantee that they will adopt an efficient system of audit. This opinion is only strengthened by the attitude of the "Accountant"—which represents the profession—towards the method of auditing brought to light by the Millwall Dock scandal.

Our contemporary, which in another part of the same article speaks so scornfully, but with perfect justification, of the apathy and ignorance of shareholders, and their incapacity to rightly judge the worth of an auditor, thinks to turn the edge of any criticism of the manner in which the Auditor of the Dock Company performed his duties, by pointing to the fact that the shareholders of the Company have expressly gone out of their way to absolve the Auditor in question from any breach or neglect of duty. We do not urge that there was any breach or neglect of duty in the case in point. What we contend is that there was a complete failure to realize the meaning of an auditor's duty—a failure all the more surprising in view of the opinions expressed by Mr. Justice Vaughan Williams in the case of the New Zealand Loan and Mercantile Agency Company. Our opinion upon the attitude of the Millwall shareholders was recorded in an article in the "JOURNAL" for the 7th of November

last, which has apparently escaped the notice of the Editor of the "Accountant." We take the opportunity of saying that the attitude of the profession towards auditors who adopt methods ludicrously inadequate for the discovery of fraud (the question of the character of the certificate given should not be considered—nothing but a full and satisfactory certificate should be permitted to a professional accountant) is, if it be indifferent, capable of very seriously depreciating the value of auditing in the eyes of the public, or rather of preventing a restoration of public confidence in the utility of auditors, which has been severely shaken of recent years.

It is, then, because we have no sufficient means by which to judge whether a professional auditor is likely to adopt an efficient or a farcical system of examination, that we consider that the accountants of similarly conducted concerns are the best qualified men to audit the accounts of such undertakings as gas and water companies. If they have not the qualifications to examine accounts, and judge of the fairness of valuations and depreciations, they are obviously not qualified to have charge of the accounts of a company of similar character to the one in need of an auditor. On the particular question of valuation of stocks, a man who, by reason of his employment, is thoroughly acquainted with the character and current value of the goods held in store by a company, is certainly better qualified to audit its accounts in that respect than a professional auditor. So also with the matter of depreciation. An auditor, says our contemporary, "cannot pose as a specialist in the value of land, plant, and machinery; and, if he has the assurance of the directors and other responsible officials of the company that the reserve which has been made is, in their opinion, adequate, he would be a bold man to—in any normal case—put in his 'inexpert' opinion against their opinion, which is at least supposed to be that of persons experienced in that particular class of business." Obviously, then, a responsible official, experienced in the particular kind of business in which a company is engaged, would be a more efficient auditor of its accounts than the inexpert professional auditor. In view of what has been urged in previous articles, we need scarcely say that from the view that an auditor should ever accept "the assurance of the directors and other responsible officials" of a company for the accuracy of any portion of its accounts, we entirely dissent. It is, in our opinion, the prevalent practice so to do that renders so much auditing perfectly futile; and we took the case of the Millwall Dock Company—with its Auditor under the "mesmeric influence" of Mr. Birt—as an example whereby to call attention to the worthlessness of such audits.

The "Accountant" remarks that, from the general tone of our articles, it imagines that the auditing of the companies for which we specially cater is at the present time in a very defective condition. We especially declared, in the article in the "JOURNAL" for the 11th of April last, that we had confined our attention to, and drawn instances from, the accounts of gas undertakings in the Metropolis, not because we thought they were any less efficiently audited than those of the generality of large trading companies, but rather because criticism is usually more useful if it be particular instead of general in its aim. We further declared our belief that the vital weakness to which we had called attention—that of auditors relying upon the certificate of the very servants whose possible dishonesty it is their duty to detect—renders more or less valueless the certificate attached to the balance-sheets of nine out of ten public companies. We certainly are able to pronounce an opinion upon the manner in which gas and water companies' accounts are often audited—an opinion which we can assure our contemporary is not based upon surmise—with more certainty than upon the auditing of other companies. But the revelations in the cases to which reference has been made, and in others, and the failure of the profession to express clearly their absolute condemnation of the methods of auditing thereby disclosed, are sufficient to warrant our scepticism as to the value of the audits of other large undertakings. We may remark that in auditing, as in other professions, we do not deem a man to have necessarily performed his duties adequately, if he be acquitted of failure to fulfil his legal obligations. If the law does not take a sufficiently strict view of an auditor's duties, and auditors give occasion for the belief that they merely confine themselves to not breaking the law, the profession must suffer heavily in reputation.

In the previous article, we expressed the opinion that, in the case of firms of accountants with a large volume of business, the result was, not infrequently, that more work was undertaken than could be properly and carefully done—the bulk of it being left in the hands of irresponsible clerks, many of them none too well paid. The "Accountant" thinks we implied that no good auditing work is to be expected from a firm delegating the bulk of its work to clerks, and proceeds to state, with the authority it can well claim in such matters, "that, although necessarily a very large amount of the work transacted by the largest firms is perforce left to the supervision of senior clerks, those clerks cannot accurately be described as either irresponsible—being in many cases A.C.A.'s themselves—or as being insufficiently remunerated to secure good work." We willingly put our contemporary's statement on record, while disclaiming the interpretation of our remarks as implying that no good auditing work could be expected from subordinates. They were intended to convey the fact that, personally, we should prefer the service of a principal with adequate time at his disposal, to that of an overworked subordinate; just as we should prefer to be attended in sickness by a family physician with a comfortable practice, to being doctored by the qualified, but less experienced, assistant of a medical man with more patients than he knew exactly how to attend.

We are well aware of the difficulty that auditors have to face when they find themselves in disagreement with the management of a company, by reason of the tendency of shareholders to resent any criticism of a management that offers them a big dividend—whether justified by the financial position of the company or not; and we have frequently expressed regret at the indifference of shareholders to everything past, present, or future except the current dividend warrant. But the ignorance and apathy of shareholders does not relieve auditors of their responsibility to efficiently audit, and faithfully report upon, the accounts laid before them. We therefore cannot endorse our contemporary's conclusion that, if the results of auditing have, in some cases in the past, been unsatisfactory, "the blame is far more due to the apathy and ignorance of shareholders than to the neglect or incompetence of accountants;" and that "if any material improvement is to be effected, it must be for the most part looked for among the former, rather than the latter." If the indifference of shareholders tends to lead auditors into the temptation of being inefficient, it only behoves the auditing profession the more strenuously to resist the temptation, and the more resolutely to do their duty. We would rather see their organ urging this upon them than be labouring that hopeless personage, the average shareholder. We shall continue, so far as we are able, to arouse both shareholders and auditors to a livelier sense of their duties; looking, however, for reform on the part of the latter rather than on that of the former.

THE INTRODUCTION OF GASLIGHT INTO PAISLEY.

THE recent adoption of the electric light in Paisley may be regarded as a fitting time for saying something about the introduction of gaslight, and of the method in which it was taken under municipal control.

At a public meeting held in Glasgow in November, 1816, it was agreed to constitute a joint-stock company to manufacture gas from coal, and to apply to Parliament for powers to do so. It was announced by the Company in March, 1818, that their works were in such a state of forwardness that they were able to supply gas to the city. Paisley being only about seven miles from Glasgow, many of the inhabitants made a point of going to the big city in order to see the new system of lighting in operation. The first movement that was made in the "weaving town," as Paisley then was, regarding the use of coal gas was in 1819, when Mr. James Williamson, a china merchant in the High Street, and others, applied to the Town Council for permission to convey gas by means of pipes across the streets opposite to their premises. This permission was most cheerfully given by the Council; and they expressed their readiness to afford every facility and encouragement to any measure of the kind.

The first steps for the establishment of a company in Paisley to make gas were taken in the month of September, 1821. The Council were asked by the promoters of the scheme to take some shares; but they declined to do so, with expressions of regret—alleging that the condition of the community's funds did not justify them in taking such a step. They nevertheless hoped that the undertaking would be beneficial to the public as well as profitable to the promoters. Sufficient funds, however, were obtained, and the promoters applied to Parliament for an Act for the better lighting of the town. The following was a part of the preamble of the Bill: "Whereas inflammable air or gas, coke, oil, tar, pitch, asphaltum, ammoniacal liquor, essential oil, pyroligneous acid, charcoal, and other products, may be procured from coal, oil, tallow, tar, peat, turf, rosin, wood, and other inflammable substances, and whereas the said inflammable air may be safely and beneficially used for lighting the streets," private houses, &c., "and the coke may be beneficially employed as fuel," and the oil, tar, and other inflammable substances already mentioned, "may be used and applied in various other ways with great advantage," &c. In due course, the Bill was passed, and the Paisley Gaslight Company so incorporated was authorized to raise £16,000 in shares of £5 each, and to borrow a further sum of £4000. The Royal Assent was given to the Act on May 30, 1823, and the first Directors of the Company were: Ludovic Houston, the "laird" of Johnstone, Governor; R. Farquharson, Deputy-Governor; and Messrs. Alexander Fullarton, James Buchanan, W. Waterston, John Orr, John Bell, James Wylie, Joseph Twigg, William Gilmour, James Jackson, and George Millar. Without any loss of time, operations were commenced; and the Directors applied to the Council on the 23rd of August in that year for permission to open some of the streets to lay pipes. In the following year, the greater number of the householders of Paisley were enjoying all the comforts to be derived from this vastly superior mode of supplying themselves with artificial light. Not only did they go in for a supply of gas as soon as the Company were in a position to give it, but during the early years of the history of the undertaking they followed the example of the first consumers of the gas to such an extent that in 1832 the Company obtained additional powers from Parliament to raise capital to the amount of

£16,000, in shares of £5 each, with power also to borrow half as much more. This money was required for the extension of the works in order to meet the increasing demand for gas.

When eleven further years had passed—viz., in 1843—a new Gas Company was formed; and on the 29th of January, 1844, the "interim" Directors applied to the Town Council to consent to their operations being carried on in the meantime without an Act of Parliament, and to allow pipes to be laid in the streets. On hearing of this application, the Directors of the existing Company desired the Council to give them an opportunity of stating their objections before coming to any decision upon the application. In due course the meeting took place; and the Council afterwards appointed a Committee to confer with the Directors of the old Company on the subject of ceding their works to the Council for the benefit of the public, which it had been announced they were willing to do on terms advantageous to the community. Some correspondence and meetings took place; and afterwards the heads of an agreement were passed for merging the Paisley Gaslight Company into a public Trust in connection with the Corporation. This was agreed to, and signed by both parties.

The leading terms of the engagement were that the Trust should be constituted with a view to securing cheap lighting for the town; that the £5 share of the Company should be valued at £8, which was the market price at the time; and that the shareholders should receive 4 per cent. thereon. Another condition was that the Board of Management should consist of twelve Trustees, eight of whom should be elected by the shareholders and four by the Town Council. Then, when one-fourth of the capital should be paid up, the Council would elect five, and when one-half six, Trustees. This system was to be continued till the end of the Trust. The Council were also to have power to terminate the Trust by paying out the shareholders, and to be entitled to borrow money on the works for the purpose. This arrangement was only to be carried into effect in the event of the new Company not obtaining their Act. The subject of this agreement, and the prosecution of the new Gas Bill, involved many public meetings, and caused much excitement in the town. The Bill passed the Committee of the House of Commons; but while pending in the House of Lords, an arrangement was made whereby, on payment of £3600 by the old to the new Company towards defraying expenses, it was agreed to except Paisley, within the parliamentary limits, from the new Bill. This arrangement was sanctioned by Parliament. Subsequently parliamentary notices were published, and a Bill was prepared to carry out the agreement between the Council and the old Company. The Bill, establishing the gas supply undertaking as a public Trust (passing through both Houses of Parliament without opposition), received the Royal Assent on June 30, 1845.

The price of gas in Paisley in 1844 was 7s. per 1000 cubic feet—said to be the cheapest in Scotland at the time. But the town has always been famed for its cheap gas.

PERSONAL.

The position of Assistant-Manager at the Cleethorpes Gas-Works has been obtained by Mr. R. Silcox, son of Mr. J. H. Silcox, Manager of the Pembroke Dock Gas Company.

Mr. H. B. Heath, who has been in the service of the Plymouth and Stonehouse Gas Company for upwards of thirty years, has been appointed Secretary, in succession to the late Mr. John Thomas.

Mr. G. R. Love, Assoc.M.Inst.C.E., of Dundalk, has been appointed Manager of the Guildford Gas-Works, in succession to Mr. E. P. Reilly. Applications for the position were invited in the "Journal" for the 5th ult.

Mr. Edward Hargreaves, of the Hastings and St. Leonards Gas Company, has been successful in obtaining the position of Superintendent of the Gas-Fitting Department of the Bombay Gas Company, advertised in the "Journal" for Dec. 12.

At the meeting of the Birmingham City Council on Tuesday, the recommendation of the Finance Committee, referred to last week, that Mr. Thomas H. Clare should be appointed City Treasurer, in succession to the late Mr. Hughes, was adopted without dissent.

Mr. Herbert Gandon, of the Crystal Palace District Gas-Works, has been appointed Superintendent of the Neepsend works of the Sheffield United Gas Company, in succession to Mr. A. Allan, applications for which position were invited in the "Journal" some weeks ago. He entered upon his duties yesterday.

Mr. Walter Donaldson has not long held the position of Secretary and Cashier of the Longton Corporation Gas Department. He was only appointed at the end of May last, and already he has tendered his resignation, which has been accepted. Mr. Joseph Speakman, a clerk at the works, has been appointed to succeed him, at a salary of £100 a year.

The Neath Town Council adopted last Thursday a recommendation of the Gas Committee to award a sum of £200 to Mr. R. A. Browning, Assoc.M.Inst.C.E., their Gas Engineer and Manager, in recognition of his services in connection with the extensions and improvements carried out at the gas-works in accordance with plans prepared by him, as described in the "Journal" for the 5th ult. The award was accompanied by some highly complimentary remarks.

As will be seen by the paragraph which appears elsewhere, the Gas Committee of the Manchester Corporation have appointed (subject to the formal approval of the City Council) Mr. John Gibson Newbigging, Assoc.M.Inst.C.E., Engineer and Manager of the Macclesfield Corporation Gas-Works, as Engineer to the Gas Department, in succession to the late Mr. G. E. Stevenson, at a salary of £800 per annum. The successful applicant for the position, the duties in connection with which were specified in the advertisement which appeared in the "Journal" some weeks ago, is a son of Mr. Thomas Newbigging, of Manchester, in whose office he served his articles. During the five years he was with his father acquiring a knowledge of gas engineering, he studied chemistry at the Owens College, under Sir Henry Roscoe, F.R.S. In order to obtain a practical mechanical knowledge of the construction and working of gas apparatus, he spent two years at the works of Messrs. J. & J. Braddock, of Oldham—working at the bench in the manufacture of gas plant of all kinds. His first appointment was as Assistant at Regent Road and Liverpool Street works of the Salford Corporation, whence he was transferred to the Bloom Street station, of which he was entrusted with the entire charge. In 1888, he was successful, out of a large number of applicants, in obtaining the position of Engineer and Manager of the Pará Gas Company, which he held for upwards of two years—relinquishing it only on account of the unhealthiness of the climate. In 1891, he visited the United States, with the view of extending his knowledge of the system of manufacturing carburetted water gas. Returning to England, he entered the service of the Macclesfield Corporation; and during the seven years he has been with them he has entirely remodelled and extended the manufacturing and distributing plant, at a cost of about £20,000; increasing the capacity of the works from 750,000 to 1,500,000 cubic feet per day. Under his management, the price of gas has been reduced from 3s. to 2s. 6d. and 2s. 4d. per 1000 cubic feet. In addition to his engineering acquirements, Mr. Newbigging has had considerable experience in parliamentary, assessment, and consulting work. As he is in the prime of life—being only 37 years of age—there is every probability that the Gas Committee will have for some years the benefit of his services, which we sincerely trust may ensure the continued prosperity of their great undertaking.

OBITUARY.

The death is announced of Mrs. Georgiana Laming, widow of the late Mr. Richard Laming, M.R.C.S., whose name was for some years before readers of the "Journal" in connection with the subject of gas purification. Mrs. Laming survived her husband by rather more than twenty years.

We regret to record the death last Wednesday, in his 71st year, of Mr. Thomas Trewhitt, Secretary of the Hartlepool Gas and Water Company. Deceased had not been in good health for some few months, having had a slight paralytic seizure in May last. This was followed by other attacks, to one of which he succumbed. Mr. Trewhitt was a native of Hutton Bonville, near Northallerton, and went to Hartlepool when he attained his majority. After being two years in a merchant's office, he entered the service of the Gas and Water Company in 1852, and was shortly afterwards appointed Secretary—a position which he retained till his death. He was one of the earliest members of the British Association of Gas Managers—his name being on the list of applicants for admission presented at the fourth annual meeting of the Association in 1867; and his connection with that body was never severed. He was also a member of the North of England Association of Gas Managers, of which he was President in 1881. The late Mr. Trewhitt was of a kindly, genial disposition, and had a large circle of friends in the Hartlepools. Testimony to his worth was borne by his appointment as a Justice of the Peace in 1883. He leaves a widow, two sons, and two daughters. The funeral took place last Saturday in the West Hartlepool Cemetery, amid many manifestations of regret; Mr. Trewhitt's courteous bearing having won for him the respect and esteem of his fellow-townsmen. A large number of private and professional friends were present, as well as the Mayor and Corporation of Hartlepool, and the Directors, officials, and employees of the Company.

The Production of Calcium Carbide.—In an article in the current number of the "Electrical Review" on the "Electro-Chemical and Electro-Metallurgical Industries in 1899," Mr. J. B. C. Kershaw points out that in the report upon calcium carbide which appeared in that paper twelve months ago, a list of 51 places was given where this product was already manufactured, or where factories were in course of erection. The number is now 93, distributed as follows: Works in operation (76)—France, 21; Switzerland, 11; Austria and Hungary, 8; Germany, 8; Italy, 7; United States, 6; United Kingdom, 4; Norway and Sweden, 4; Spain, 2; Russia, 2; Canada, 2; Belgium, 1. Works in course of erection (17)—France, 5; Switzerland, 3; Austria and Hungary, 3; Norway and Sweden, 3; Italy, 1; Russia, 1; Canada, 1.

NOTES.

The Lubrication of Machinery.

The oil expert of the "Ironmonger" expresses surprise that the oiling of an engine has not yet been made a special science. Bad lubrication means waste of power and fuel, many an engine driver squandering tons of fuel in the attempt to save gallons of oil; and it is easy enough to do. The evil of using too much oil is almost as bad. The first necessity is a good lubricant which contains nothing likely to injure the machinery. In this connection, the quality of viscosity of a lubricant comes into prominence. It was once thought that the specific gravity of an oil determined its lubricating value; but this idea has long been exploded. Yet it is not an easy matter to select a lubricant that possesses the exact degree of viscosity for a particular use. The chief lubricating oil used in this country is now American petroleum, which is sold in various grades for different purposes. Russian oil comes next in quantity. It is stated that water is sometimes mixed with lubricating oil—probably where the premium system of rewarding frugal enginemen is in vogue—but this is a very ill-advised proceeding on all accounts. In Germany, very exact specifications of lubricating oils, ignoring their origin, are prescribed. A close study of the detailed regulations laid down by railway companies for their supplies of lubricants is recommended to those purchasers of the article who wish to conform to the most enlightened practice in this regard.

The Portability of Oil Fuel.

According to the "American Machinist," the oil-engine is one of the prime motors best deserving the attention of mechanical engineers, judged on the basis of the potential power of the medium used as the source of energy. The following classification is given of this and other kinds of prime movers using stored energy, showing the comparative capacity of the different media for storage reduced to the standard of a pound weight. Thus, a good electrical storage battery will carry 15,000 foot-pounds per pound of "medium." Liquid air, expanded from 2000 lbs. pressure down to that of the atmosphere, will liberate 139,100 foot-pounds per pound. Good steam coal, in a steam plant of 12½ per cent. efficiency all told, will give 1,408,000 foot-pounds per pound of medium. Common kerosene, of 20,700 British thermal units calorific power, used in an oil-engine of 35 per cent. efficiency all told, will yield 5,593,000 foot-pounds of energy per pound of the medium. According to this valuation, kerosene oil is the most concentrated form of fuel available for the generation of mechanical power, and consequently the most suitable for carriage to long distances. It is 400 times as efficient as the best secondary electric battery—that is to say, all other things being equal, 1 lb. of kerosene is able to do as much work as 400 lbs. of storage battery. It is easy to carry out this calculation for the different descriptions of combustible gas suitable for use in internal-combustion engines, from the poorest blast-furnace product to the rich natural oil gas of Pennsylvania and Ohio—up to now the richest gaseous fuel ever offered to the uses of mechanical science.

Mechanical Coke Quenching.

According to a statement of the "Iron and Coal Trades Review," Herr Joseph Muller, of Mathias Colliery, Essen, has undertaken the mechanical handling of retort-oven coke in a truly heroic style. His arrangement includes taking hold of the red-hot coke as it is pushed out of the retorts, its immediate quenching in a bath of water, the raising it out of the water on to a grid, and its final loading into waggons or barges without any hand labour whatever. In order to effect this purpose, an iron water-tank is placed in front of the discharging end of the retort-bench with an overhanging ledge on the retort side. This tank is filled with water to the brim; and in it works a conveyor travelling in line with the retorts, but capable of being traversed sideways along the front of the bench. At the opposite edge of the tank, furthest from the retorts, there is a slope rising quite clear of the water and terminating in a grid stage. Beyond this, again, is the tip into the waggons or boats. This simple plan describes itself. As the coke emerges from the retort, it falls into the tank and upon the submerged conveyor. When it has gone halfway across the tank, it comes up out of the water, which thus drains off, while the coke is still hot enough to dry itself during the remainder of its travel. It is consequently almost dry when it is deposited on the grid, where it is freed from ashes and awaits tipping. Success is a question of adjusting the strength of the scantlings and the power and rate of movement of the conveyor to the requirements of the coke charges. One feature of the arrangement is that the quenching is done, if expedient, wholly under cover; a light roof sealed in the water keeping in all the steam.

The Efficiency of the Westinghouse Gas-Engine.

An elaborate report on the efficiency of the Westinghouse gas-engine was submitted by Mr. C. H. Robertson at the last meeting of the American Society of Mechanical Engineers. The engine in question was rated at 125-horse power, and forms part of the Merchants' Electric Lighting Company of Lafayette, Indiana, and is one of a pair using natural gas. It was laid down in 1898; and has three cylinders, 13 inches diameter and 14 inches stroke. The test was made between 7 and 12 p.m. on March 23 last; the time being chosen so as to take in a considerable load variation and register the performance under variable conditions. The object of the test was to secure reliable data respecting the power developed, gas consumption, speed regulation, and the amount of lost heat by the cooling water of the cylinder jackets and by the exhaust. The full particulars of the test are reproduced in the "Engineering Record." The natural gas which was used as fuel was analyzed, and contained 92·05 per cent. of methane and 1·15 per cent. of hydrocarbon and carbon monoxide. Nothing was done to secure special conditions for the test. The gaseous mixture in the cylinders was first 1 to 11 of gas and air, and at the last 1 to 12. The best thermal efficiency of the motor was 17·3 per cent., which is not high for a gas-engine, but is seldom equalled in steam-power plant. About one-fifth of the heat energy of the fuel reappeared as work in the cylinder; while three-tenths of it was absorbed by the jacket, and one-half passed out in the exhaust. The cylinders ran hot enough to dispense with the igniters for a part of the run. The natural gas is supplied to the Company at the price of 7 c. per 1000 cubic feet, and at the best was consumed at the rate of 14·71 cubic feet per brake horse power hour. The highest consumption was about double this.

Tests of Fireproof Building Construction.

During the last year, useful work has been accomplished at the testing station of the British Fire Prevention Committee, which is the first establishment opened for the express purpose of ascertaining the actual facts of the endurance of so-called fireproof building construction. It is a poignant satire upon the usual advertised proprietary systems and materials designed to resist fire, that these have hitherto been marketed upon the owners' valuation, with the not unnatural result that frequent disastrous conflagrations have demonstrated the difference between intention and realization in this connection. Speaking generally, the experimental work of the Committee has gone to show that the quality of being proof against catching or communicating fire, or not being destroyed or consumed by fire, is a question of degree. It was once held that building construction of non-inflammable materials was a safeguard against fire; but ample experience exists to prove that for a building to easily succumb to fire, although its materials will not actually burn, is as bad as a conflagration of the building itself and its contents. Architects have been slow to discriminate in this regard between the reasonable requirements of different classes of buildings—prescribing, say, the same floor construction for a common lodging-house as would be appropriate for a City warehouse. Practically, fire-proof building construction has branched out in the two directions of coke-breeze concrete and moulded terra-cotta. This observation refers to floors and ceilings. So far, the concrete construction only has occupied the attention of the Committee; the terra-cotta firms having held aloof. It has transpired, among other things, that the provisions of the existing Building Acts, which were chiefly based on *a priori* grounds, utterly fail to meet the stress of crucial experiment. Even in their first year of work, the Committee have succeeded in placing fire prevention building construction upon a more secure foundation of knowledge than was previously available to any of the general public.

Sir W. Crookes's Alarmist Address.

After a considerable interval, spent in the reception and refutation of certain criticisms, Sir W. Crookes has put forth in book form his ideas, given in his presidential address to the British Association at Bristol, concerning the coming scarcity of wheat in the earth, and the means of dealing with it. Hereupon, Sir R. Giffen falls upon him in "Nature," and attacks the conclusion arrived at by Sir W. Crookes, from fair premises, by the chain of reasoning made familiar by Malthus, Jevons, and others before him. It is obvious that with a larger ratio of the growth of consumption of any necessary of life, than that of its increased production, the realization of scarcity is only a question of time. This is how Jevons was able to predict the exhaustion of the British coalfields. Sir R. Giffen holds that all such speculations must only command limited acceptance, because they depend upon the assumption that the present conditions remain unaltered. Experience of these discussions since the time of Malthus has gone to show that, as yet, we are either too far away from the limits when shortness of the supply of food, coal, and raw materials generally will be felt, to realize the factors of the problem with any degree of precision; or we know too little as to the ultimate causes of existing conditions to be able to predict whether they will be soon changed or not. As regards Jevons's prediction, it is remarked that the growth of the demand has by no means continued at the rate found by him to prevail for his time; while the influence of the price of coal as a factor in production has diminished in consequence of the greater effectiveness of the machinery which coal is used to drive. Sir R. Giffen accuses Sir W. Crookes of disregarding the warning of experience against these precise forecasts in the Malthusian manner. As to the suggested remedy for too little wheat—the fixation of the nitrogen of the atmosphere—Sir R. Giffen observes that it is a subject which may well be entirely disconnected from the alarmist statistical papers to which it is generally attached.

TECHNICAL RECORD.

INSTALLATION OF INCLINED RETORTS AT THE LEIGH (LANCS.) GAS-WORKS.

About eighteen months ago, a Local Government Board inquiry was held at Leigh (Lancs.), with respect to an application made by the District Council for sanction to the raising of £25,000 for the extension of the gas-works, necessitated by the great increase which had taken place in the population and manufactories during the past few years. This was clearly shown by the figures submitted to the Inspector, on the occasion referred to, by the Clerk to the Council (Mr. P. Thomas). He showed that, whereas in the year ending March 31, 1888, the output of gas was about 54½ million cubic feet, and the number of consumers 1820, on the corresponding date in 1898 the figures were 110¾ millions and 4480 consumers—an increase to the extent of 101 per cent. At the date of the inquiry, the maximum

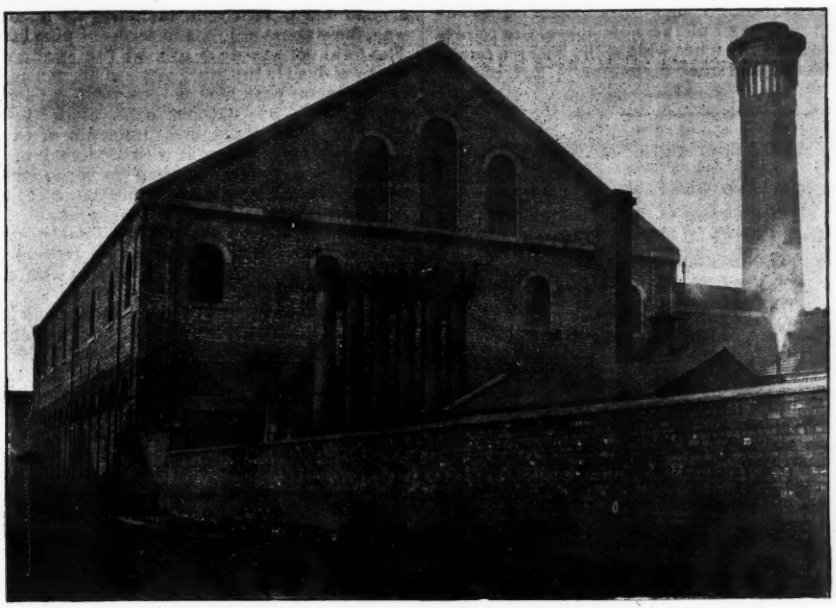


FIG. 1.—NEW RETORT-HOUSE AT THE LEIGH GAS-WORKS.

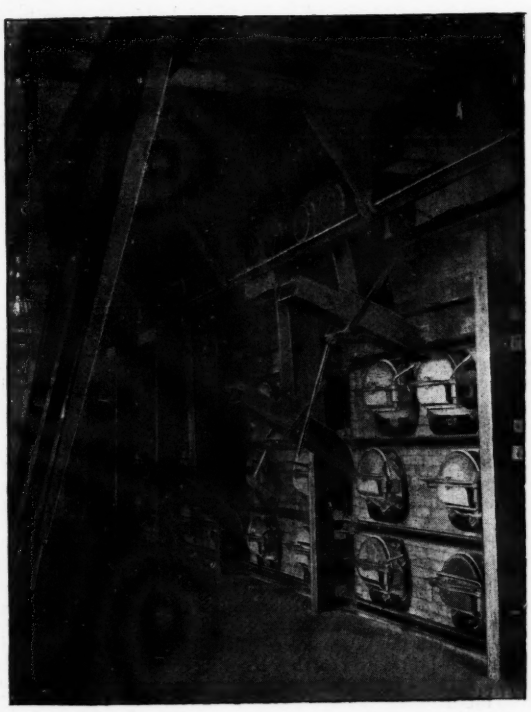


FIG. 2.—CHARGING STAGE.

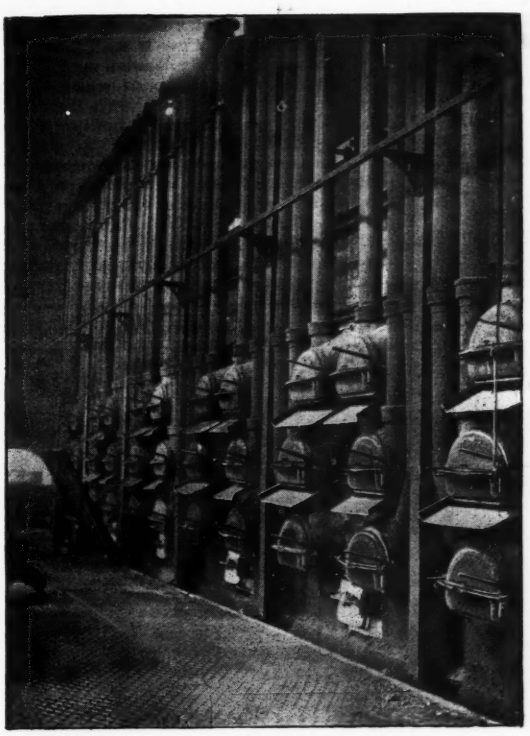


FIG. 3.—DRAWING STAGE.

daily make of gas was 607,000 cubic feet; but it was expected that in the succeeding winter it would be 700,000 cubic feet. The manufacturing capacity of the works had already been raised by the provision of 98 new 10-feet retorts in 1893; but it had been decided to replace them by 42 others of double the length. The Gas Engineer to the Council (Mr. John Foster) had devised a scheme for the projected extensions, and this he submitted to the Council towards the close of 1898, accompanied by a statement showing the advantages which would accrue by carrying it out. The detailed cost of the new plant amounted to £26,795; but deducting £3500 for old materials, the total sum required to be spent would be £23,295. The saving to be effected by the change of retorts was expected to be about £1002; in coke, £150; and in men's wages, £72—making a total of £1224. The tenders which had been received for the projected works were opened early last year; and it was resolved to accept that submitted by Messrs. Graham, Morton, and Co., Limited, of Leeds, for carrying out an installation of inclined retorts in the new retort-house. This building is shown in the accompanying illustration (fig. 1). It is

150 feet long, 50 feet high to the eaves of the roof, and 88 feet span. It has been constructed entirely of red brick, relieved by stone courses; and it is of sufficient width to take the bench of retorts and the coal-stores alongside. The contract was started on the 1st of June last, and comprised the following work: Putting a new roof (slated) on the building; taking down the old retort-bench, and laying the foundations for, and erecting the new one, including the main piers, arches, furnaces, retort-fittings, superstructure, storage-tanks, elevating and conveying machinery, boiler and seating, economizers, main flue, &c.—all within the building. This work was completed on the 30th of September—less than five months from the start, which is certainly highly creditable to the Contractors. Figs. 2 and 3 show the charging and drawing stages of the new house, the retorts in which are 20 feet long and 26 inches wide at the bottom, tapering to 22 inches at the top; and they carbonize 7½ cwt. of coal per charge.

THE ELECTROLYSIS OF CAST-IRON WATER-MAINS.

Experience in the United States.

Some time ago, the Superintendent of the Metropolitan Water Company of Kansas City (Mr. G. B. Wing) detected signs of electrolysis on the pipes of the Company. He therefore requested Professor Lucien J. Blake, of the Kansas University, to make a horough investigation of the subject. The following article by him, bearing upon the matter, recently appeared in the "Electrical World" of New York.

The effects of electrolysis from electric railways are generally considered as limited to those points where currents are leaving underground metallic structures, for a passage through the soil and thence through other conductors to the power-house. Voltage measurements have been relied upon to determine the regions within which currents are thus leaving the underground structures; and these measurements establish the so-called electrolytic danger areas. Recent observations and experiments of the writer prove, however, that effects of electrolysis upon water-mains are not limited to the above determined danger areas. If the mains were continuous metallic conductors, then indeed no electrolytic dangers would occur to them outside the above areas, and they might be allowed to form a part of the return circuit of the electric railway. Then bonding these mains to return feeders would be safe and advisable, just as now the metallic sheathings of underground telegraph and telephone cables are so bonded. But, unfortunately, the mains are not continuous conductors. Resistance at the joints in cast-iron pipes is sufficient at most joints to shunt a portion of any current allowed in these mains around the joint through the soil outside, or water inside, or through both. Thus on the positive side of joints the effects of electrolysis, both external and internal, are to be apprehended. To determine this as a fact beyond question, the writer has made, first, a series of measurements upon joint resistance in cast-iron mains, both in the laboratory and in the field; and, secondly, has discovered in many instances the actual electrolytic effects, both external and internal, near the joints.

Three lead-caulked joints, from a 6-inch cast-iron main, taken from the Kansas City water system, were measured by voltmeter-ampère-meter method, with the following results:—

—	E.M.F. (Around Joint).	Current.	Resistance.
	Millivolts.	Ampères.	Ohm.
Specimen I. . . .	24	0·9	0·0266
„ II. . . .	45	11·4	0·0321
„ III. . . .	37	1·4	0·0264
			Aver. 0·0243

The resistance measured of a 12-feet length of this pipe gave 0·000354 ohm. The average resistance of these joints, then, is 79·9 times the resistance of one length of the pipe. The current was supplied from chloride accumulators; and Weston instruments standardized by Kelvin balances were used.

Measurements were then made upon a line of 6-inch cast-iron main which has been in use now for thirteen years, and is carrying water under about 80 lbs. average pressure. This main is in the city of Lawrence, Kansas, and 687 feet of it were measured. The following table gives the results:—

No. of Test.	Drop Around Joint.	Current.	Resistance.
	Millivolts.	Ampères.	Ohm.
1	983·3	1·80	0·546
2	1000·0	1·80	0·555
3	1466·6	1·80	0·543
4	1450·0	2·70	0·537
5	1556·0	2·70	0·580
6	1516·6	2·65	0·574
7	983·3	1·80	0·546
8	1000·0	1·80	0·555
			Aver. 0·556

Resistance of 58 lengths of 6-inch main at 0·000354 ohm per length of 12 feet, 0·021 ohm; resistance of 58 joints, 0·535 ohm. The total resistance of the 58 joints forms, therefore, 96⅘ per cent. of the total resistance of the 687 feet.

Measurements of each individual joint resistance were then made upon 399 feet of 20-inch cast-iron main which had been in use in Kansas City since 1882 under 100 lbs. pressure. This main crosses the Kaw River on a pipe bridge; and the housing was removed so that each joint could be measured. The readings were taken between midnight and 5 a.m., when but one "owl" car was running hourly upon the whole electric railway system, and an invariable voltage could then be supplied from storage cells. The experiments were so arranged that voltage drop could be measured around each joint and simultaneously around one pipe length, including its particular joint. In this way, resistances of joints in terms of pipe lengths were obtained. The total voltage drop around the joint in millivolts was 221; the total drop in the pipe, 29·4—in all, 250·4. The joint resistance in equivalent pipe length was 543$\frac{47}{50}$. Therefore the resistance of the joints was 88⅕ per cent. of the total resistance. The average of six direct measurements of the total drop of the above main gives 0·3 volt with a current of 9·2 ampères. This would give a measured resistance in 399 feet of the 20-inch main of 0·326 ohm. The calculated resistance of this amount of 20-inch main, exclusive of joints, is 0·0364 ohm. The joint resistance must make up the rest of the total measured resistance, or 0·2896 ohm. The joint resistances, therefore, form 88⅘ per cent. of the total resistance, which checks with the above within the limits of error.

It should be stated that, for this calculated resistance of the pipe, measurements were made to determine the specific resistance of the cast iron of the pipes. A Thomson's conductivity bridge was used, and the average taken of several measurements on two bars cut from the 20-inch main, which were respectively 500 mm. long and ¼ in. by ¾ in. in section. The copper bar for comparison was commercial omnibus-bar ⅛ in. by ¾ in. section, 500 mm. long. The results gave an average of 56·5 times the resistance of copper of similar dimensions, and this number is used in the above calculations.

Measurements were also made on 400 feet of 36-inch main which was exposed in Kansas City. The total measured resistance, including the 34 joints, was 0·0103 ohm. The calculated resistance of the pipe alone is 0·000346 ohm. The joint resistance is therefore 96·7 per cent. of the total resistance. The current was from a storage battery, used after the railway power was cut off after midnight.

From the above direct measurements, it is evident that the joints in cast-iron water-mains form a large percentage of the total resistance of the mains, and prevent them from being considered continuous conductors in the sense a metallic sheathing of a cable is. The resistance conditions for shunting a current around the joints are therefore present in general upon water-mains. Furthermore, that such shunting actually occurs on cast-iron mains in use, and exposed to leakage currents from electric railways, has been proved by the writer by electrolytic effects discovered near joints, both inside and outside, on mains which he has taken up in Kansas City. A 12-inch pipe-line running at right angles to an electric railway, and which was negative to the rails, was found to be carrying a current of varying strength, and delivering it into a 36-inch main some 750 feet distant.

Electrolytic pittings were found on many sections near the joints, only on the positive side, where the current was shunted round the joints. Some of the pittings were ⅛-inch deep. The interior of the pipe could not be examined. Again, a length of 6-inch cast-iron main was taken up in another part of the city, and internal electrolytic effects were apparent near the joint. A chemical analysis of the material dug from the pits gave 22·3 per cent. of graphite and 49·7 per cent. of iron. A second length was removed and broken into, and a fresh fracture revealed internal electrolysis by the discoloration of the iron where the pitting was taking place, which was already ¼-inch deep, beginning from the inside. A number of similar cases were discovered, and are convincing proofs that cast-iron mains cannot convey currents without electrolytic damage when these mains form part of the return circuits of electric railways.

It is not the purpose of this paper to treat the general subject of electrolytic dangers to underground metallic structures, but to call attention to the fact that the use of grounded electric railway circuits is beginning to reveal these added dangers to cast-iron mains. The plan of occasional bonding of rails to water-pipes when the pipes are negative to the rails, and then, near the power-house, the further bonding of the pipes to return feeders, is sure to invite current upon the pipes, and thereby evidently intensify electrolytic effects at the joints. The insertion of insulating joints in the mains or an occasional non-conducting length, must act like joint resistance, and thus still further endanger the mains. So long as leakage currents are allowed to traverse the mains, it seems proved from the above that the mains are in danger; and corroborative evidence is accumulating in cities other than Kansas City, and is known to the writer. Nor does the asphaltum coating of the pipe protect it. Under the asphaltum, which remains bright and apparently intact, pittings will be found; and a fresh fracture or a careful scraping away of the coating will reveal spots of graphite structure left from electrolytic action on cast iron. It is obvious that all conduction by the pipes must be avoided to ensure immunity from electrolysis,

REGISTER OF PATENTS.

Retort-Lid Fasteners.—Holman, S., of South Kensington. No. 210; Jan. 4, 1899.

The patentee proposes to dispense with any cross-bars, and effect the securing and releasing of the lid by an eccentric and handle, which, when turned in one direction, effects the securing of the lid, and when turned in the other direction, releases it.

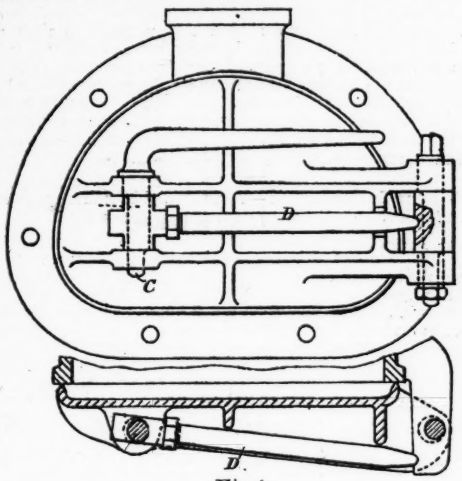


Fig. 1.

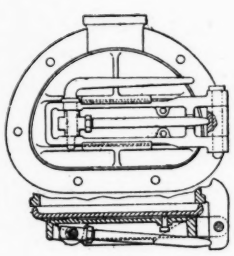


Fig. 2.

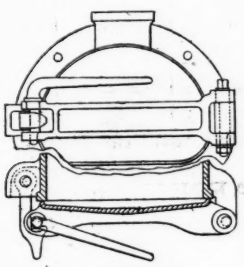


Fig. 3.

The arrangement represented in fig. 1 is as follows: In bearings in webs or lugs formed on, or fixed to, the lid, is mounted a pin C formed with an eccentric part, and provided with a handle for operating it. On the eccentric part of the pin is carried one end of a strut or lock-bar D, the other end of which bears upon a stop on some fixed part in proximity to the lid—preferably on a lug on the mouthpiece on which the lid hinges. After the lid is closed against the mouthpiece of the retort, the pin is turned in a direction which causes the eccentric part of the pin to force the strut or lock-bar D against the stop (the lug in the arrangement shown), which has the effect of pressing the lid firmly against the mouthpiece, so as to make a tight closure. To open the lid, the handle is turned in the opposite direction, so that the lock-bar D is released from the stop, and the lid is free to open.

The arrangement shown in fig. 2 is generally like that just described; but, instead of the webs or lugs being formed on the lid, the lid is made separately, and connected to the webs or lugs by guide-pieces, so that it can be slid longitudinally, and fixed by screws.

In both these arrangements, one lug only is required on the mouthpiece—viz., that on which the lid is hinged. But, if preferred, instead of using the strut or lock-bar D, the eccentric may be at the ends of the webs or lugs cast on, or secured to, the lid as shown in fig. 3—the webs and lugs projecting sufficiently to embrace a swivel-catch centered on the side of the mouthpiece opposite to the hinge—the catch being so formed as to engage with the eccentric part of the pin, so that when the pin is turned in one direction it, by pressure on the part of the catch on which it bears, forces the lid tightly against the mouthpiece, and when turned in the other direction releases the catch so that the lid can be opened.

Internal Combustion Engines.—Kitchen, J. G. A., of Manchester. No. 466; Jan. 9, 1899.

This invention relates, more particularly, to internal combustion engines in which a mixture of gas and air is drawn in, compressed, and exploded in a cylinder behind a piston, the reciprocating motion of which is converted into rotary motion; the chief object aimed at being "to make such an engine capable of having its power and speed varied when running by increasing or reducing the degree of compression of the combustible charge."

This is effected by varying the stroke of the piston, and compensating for the difference between the stroke and the sweep of the crank by the interposition between the piston and the connecting-rod of suitable link-work or lever motion working upon a moveable fulcrum. A cylinder is employed in length proportionate to the throw of the crank of the motor-shaft, and having a clearance space for using a combustion chamber of suitable proportions. The piston is connected with a link forming a lever, one end of which is mounted upon a bearing capable of having its position with respect to the cylinder varied so as to shorten the distance between the fulcrum and the point of connection of the piston-rod to the lever. These means may consist of a stationary slide, in which the bearing of the lever is held by a screw capable of moving it therein, or of an eccentric and worm adjustment. To the other or free end of the lever, is attached the connecting-rod.

The engine illustrated by the patentee in his specification is designed chiefly with a view to adaptation to motor-carriages, and is shown with a light tubular frame or bed, and other lightly constructed parts.

Internal Combustion Engines.—Hamilton, J. H., of Sandiacre. No. 1711; Jan. 25, 1899.

The first part of this invention relates to an arrangement for circulating water through the piston of an internal combustion engine; and the second part, to the valve which regulates the time of ignition, when a hot tube is used for igniting the charge. This latter consists of a small valve held to its seat against the pressure inside the cylinder by a spring, and pulled away from the seat by a lever operated by a cam. A nut is screwed on the valve; and the end of the lever works against the nut, the screwing on or off of which alters the time of ignition.

Extracting Naphthalene from Coal Gas.—Irwin, W., of Manchester, and Leather, J. P., of Burnley. No. 2318; Feb. 2, 1899.

Alluding to their proposal for "the purification of ordinary coal gas . . . to remove the naphthalene therefrom before the gas leaves the works," the patentees say that they "find that to treat or wash the gas with a large quantity of oil is an expensive process, and that to do so with oil alone also removes other illuminating substances from the gas, thereby deteriorating its quality; and that it is necessary to employ a mixed oil or spirit in very small quantities to successfully carry out the invention." Their present invention, therefore, consists essentially in treating the gas, after it has been cooled and freed from tar, with a small quantity of a mixed liquid capable of absorbing the naphthalene, and at the same time which will not deteriorate the quality of the gas by absorbing or removing benzol or other illuminating substances from it.

The liquid to be used in the process must possess the following properties or characteristics: (*a*) Practical freedom from naphthalene; (*b*) capacity for dissolving naphthalene; (*c*) capacity to give off at the ordinary temperature a vapour whose tension and effect on the illuminating power of the gas is such, that the loss of illuminating power occasioned by the extraction of naphthalene and other substances is more than compensated by the gain from other substances taken up by the gas from the liquid itself.

They find that suitable liquids possessing the above properties are obtained by mixtures of (*d*) Blast-furnace oil and low-boiling aromatic hydrocarbons; (*e*) heavy tar oil and low-boiling aromatic hydrocarbons. A convenient low-boiling aromatic hydrocarbon is ordinary 90 per cent. benzol.

They also find that good results are obtained from washing liquids having the following composition: (*f*) Blast-furnace oil 92 per cent.; benzol 8 per cent. (*g*) Heavy tar oil 92 per cent.; benzol 8 per cent.

The amount of the washing liquid to be used will depend upon the temperature of the gas under operation; as the lower the temperature to which the gas has been cooled, the less the proportion of naphthalene it will contain. Gas cooled only to 80° Fahr. is found to contain more than double the amount of naphthalene than gas which has been cooled down to 60° Fahr.

The following quantities of the wash-liquid are approximately what (according to the patentees) will be required to give the best results: Gas at 60° Fahr., 15 gallons per million cubic feet; gas at 70° Fahr., 25 gallons per million; and gas at 80 Fahr., 40 gallons per million.

When the oil or wash-liquid becomes saturated with naphthalene, the benzol or light, or low-boiling hydrocarbons may be extracted from it by distillation, and recovered for mixing with a fresh quantity of oil, or for future use.

The plant required is similar to that employed for the extraction of ammonia from gas; but the patentees specially recommend a washer in which the liquid can travel in a direction contrary to that of the gas, through a series of chambers, in each of which it is brought into intimate contact with the gas. Apparatus half the size of that usually employed for the extraction of ammonia from gas will, it is said, be found sufficient.

Gas-Motor Engines.—Nunn, F. C., of Sydenham, S.E., and White, T. H., of Carshalton. No. 2847; Feb. 8, 1899.

This invention relates to an arrangement of gas (or oil) motor engines, wherein the moving parts are balanced. For this purpose, the cylinder—conveniently horizontal—is fitted with two pistons connected to cranks on two shafts, each having on it a fly-wheel and a pinion. The two pinions gear with an intermediate wheel, of double the diameter of the pinion, on a shaft which works the valve gear. The cranks on the two shafts are so set that the two pistons approach each other in their instroke, and recede from each other in their outstroke. Between them are the combustion chamber and the inlet and exhaust valves, of ordinary construction.

Feeding Boiler and other Furnaces, and Removing Ash and Clinkers.—Abel, C. D.; a communication from La Compagnie Anonyme Continentale pour la Fabrication des Compteurs à Gaz et Autres Appareils, of Paris. No. 4309; Feb. 27, 1899.

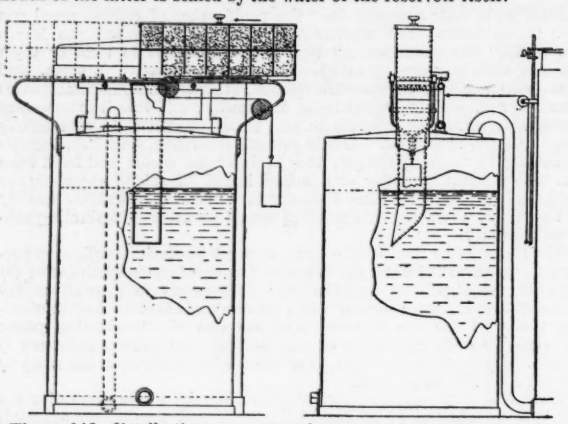
In this patented arrangement, there is employed apparatus which—as regards its main feature—is similar to that described in patent No. 12,586 of 1898 [see "JOURNAL," Vol. LXXIII., p. 1493], as applied to the feeding of gas-retorts; the fuel being raised by an elevator and delivered on to a continuous travelling apron or conveyor above the furnace, which, on the one hand, conveys it to the boiler furnaces, while on the other hand, after descending to below the furnaces, the conveyor also serves for receiving and conveying away the ashes and clinkers from the ash-pits.

For these purposes, the conveyor travels along a trough-shaped channel arranged in front of, and above, the boilers, in the bottom of which channel are openings from which shoots lead down to hoppers situated immediately above outward extensions of the fire-grates, so that the fuel carried along is made to descend through the openings of the channel down the shoots into the hoppers, and thence on to the fire-grates. The fire-grates (of any known construction) are caused

automatically to feed the fuel gradually on from the hoppers to the farther ends of the furnace, in such manner that, by the time it arrives near the fire-bridge, it is consumed to the condition of ashes and clinkers, which are discharged by the fire-grate into inclined shoots, which lead them down into a subterranean channel. Along this channel the conveyor travels in the contrary direction to its travel in the upper channel; so that the ashes delivered on to the conveyor are thus taken away by it, and discharged at any desired point, after which the conveyor ascends to the upper level again, to receive a fresh supply of fuel.

Generating Acetylene Gas.—Llorens, J., of Barcelona. No. 20,354 Oct. 10, 1899.

The generator in this arrangement (as shown) is composed of a reservoir filled with water to a convenient height, the top of which is provided with a pipe conducting the gas to the holder. The generator is provided, moreover, with a shoot or introduction pipe, the lower end of which is inclined, and receives at its upper end the carbide, which it lets fall to the bottom of the reservoir, throwing it therein sideways in order to avoid the generating gas escaping through the central pipe. The lower mouth of the latter is sealed by the water of the reservoir itself.

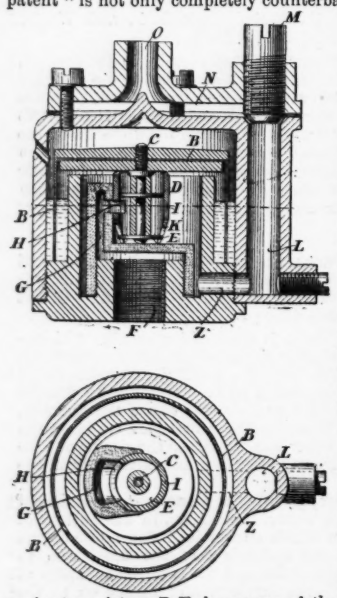


The carbide-distributing apparatus is composed of a carriage formed by a bottomless box travelling on rails. The box is divided by vertical partitions into several compartments, each of which is divided in two by a moveable horizontal partition. By these means, the number of compartments are doubled, and consequently also the number of carbide charges. The bottom of the distributing carriage is constituted by a band or strap, one end of which is fastened to the vertical back-wall of the carriage—the strap embracing the guiding rollers and ending in a weight, which gives it convenient tension and causes the carriage to advance. The carriage is mounted on wheels travelling upon rails arranged on both sides. By the action of the weight, the carriage tends to move towards the right, but is stopped by the action of locking mechanism.

When the bell of the gasholder descends, it draws a cord by its lower end; and this moves the distributing carriage over the funnel, and discharges the whole of the carbide it contains. The carbide, falling into the water of the reservoir, generates a quantity of gas which lifts the bell of the holder. The latter, in rising, slackens the cord, and draws the carriage back. This operation is repeated until the carriage has unloaded its last compartment, after which it has only to be returned to its original position and loaded again.

Regulator for Gases and Liquids.—Muhlenthal, S., and Löwenthal, M., of Berlin, and Hahn, T., of Kotzschenbroda, Saxony. No. 20,773; Oct. 17, 1899.

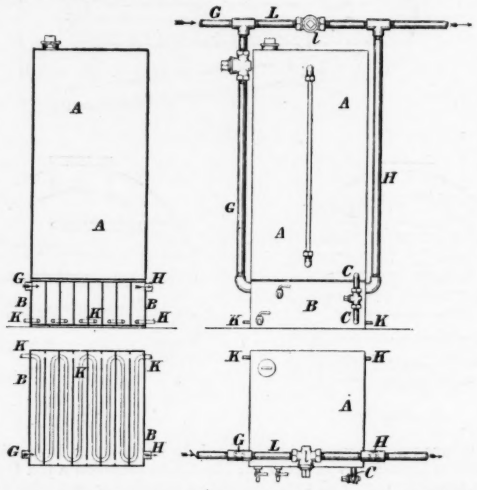
It is asserted that the pressure-regulator forming the subject of this patent "is not only completely counterbalanced, and permits of gases or liquids being delivered with a determinate amount of pressure, but it is also so constructed that, with the assistance thereof, the amount of the gas delivered, or that of the liquid entering the service-pipes, may be exactly regulated." The fluid (whether gas or liquid) arrives, in the first instance, between two pistons of equal size, one of which, according to its position, closes more or less an exit-opening. If the pressure exceeds a certain given amount, then, by the lifting of a bell or the like, a change of position of the two pistons may be provided for, and thereby the size of the opening for the passage of the fluid sufficiently altered, so that the fluid will arrive, under a certain given pressure, in a passage which, by means of a screw-valve, can be more or less closed, "so that only an exactly determined amount of the fluid can enter the service-pipes."



As shown, in the casing a bell-shaped vessel B is provided, which, floating in mercury, carries two pistons D E, by means of the rod C. The gas entering at F arrives by a passage G, in order (after passing through the recess H of the tube I) to enter between the two pistons. As these pistons are of equal diameter, the same amount of pressure will be exerted on both. The gas then passes, further, through conical notches of the tube I, after leaving which it rises upwards beneath the bell B. The parts are now so regulated that, in case the pressure exceeds a certain amount, the bell will be somewhat raised. With the change of position of the bell, however, follows also a change in the position of the two pistons. The lower one will now regulate exactly the exit-openings K in the tube I, in correspondence with the amount of pressure, so that a decrease of pressure takes place, and the gas will enter the passage Z only at the desired pressure. The gas then passes from this passage through another passage L, from which it cannot, however, arrive directly into the service-pipes, but must first pass through the screw-valve M. This is now so arranged that the gas can only escape by the passages N and O in a pre-determined amount, in correspondence with the quantity it is desired to use. The gas will therefore first be regulated in its pressure, by means of the bell B, and the pistons D and E, and afterwards in its quantity, by means of the screw-valve M.

Carburetting or Enriching Gas.—Irwin, W., of Manchester. No. 20,792; Oct. 17, 1899.

This benzol carburettor consists essentially of two vessels, preferably one superimposed above the other—the upper one forming a holder for liquid benzol, and the lower one divided by vertical partitions into a number of compartments, which are filled with shavings, coke, or other suitable material, and fitted with suitable connecting-pipes, by which the benzol passes from the top chamber to the lower one, and the gas is led to and from the lower chamber.



As shown, the apparatus is constructed with an upper air-tight vessel A, to contain a quantity of benzol or other volatile enriching liquid, and a second vessel B immediately below, or in some other convenient position, so that the benzol can flow into it from the containing vessel A. The two vessels are connected by a pipe C. The interior of the enriching vessel B is divided by a number of vertical partitions into a series of compartments opening one into the other. In the compartments strips of absorbent material (such as flannel) are attached to the sides, or else shavings, pieces of coke, or other suitable materials may be placed therein, capable of absorbing the benzol as it flows through the compartments, so as to increase the surface with which gas comes in contact. The gas to be enriched enters the enriching vessel by the pipe G, flows through the several compartments, and out through the pipe H. In large installations, the vessel B is supplied with a coil of pipe K, through which water at a temperature of about 50° to 60° Fahr. may be run to maintain the enriching liquid in the vessel at an approximately uniform temperature.

The amount of liquid that flows into the lower chamber regulates itself automatically, to correspond with the amount of liquid absorbed by the gas, on the "bird-fountain" principle; while the gas-pipes G H are carried up above the level of the upper vessel, so as to prevent the possibility of the benzol finding its way into the gas-mains. The gas inlet-pipe is provided with a stop tap and a bye-pass L, so that the whole or any given proportion of the gas may be passed through the carburettor, or direct to the service-pipes.

APPLICATIONS FOR LETTERS PATENT.

25,567.—Gunning, J., "Automatically lighting and extinguishing lamps." Dec. 27.

25,633.—Griffith, H., "Acetylene gas-machines." Dec. 28.

25,688.—Keddie, C. E. R., and Solmersitz, E., "Automatically controlling lamps." Dec. 29.

25,710.—Urquhart, R. J., "Opening gas-cocks from a distance." A communication from the Actien-Gesellschaft für Fabrikation von Bronce-waren und Zinkguss vormals Spinn und Sohn. Dec. 30.

25,725.—Knoeferl, F., "Pressure-gauges." Dec. 30.

25,736.—Schaeffer, E., "Internal combustion engines." Dec. 30.

25,756.—Pipersberg, H., "Coin-freed gas-meters." Dec. 30.

The Local Government Board and the South Staffordshire Water Company.—The Dudley Town Council have received a communication from the Local Government Board, stating that they have no power to hold an inquiry in reference to the complaint of the Corporation and other Local Authorities against the South Staffordshire Water Company, concerning the water supply, owing to the fact that the Company work under parliamentary powers.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

How Far has the Gas Workers' Union been Recognized?

SIR,—In your issue for the 26th of December (p. 1562) there are references to the dispute which is proceeding in Glasgow as to the "recognition," of the Gas Workers' Union. A list is given of certain places in the London area in which it is said that "officials of the Union meet in amicable negotiation week by week with heads of departments." Your Scotch correspondent very properly points out that in the portentous list given "it is not said that the Gas Department is involved." It may therefore be asked: To what Union is reference here made; how are these "amicable negotiations" carried on; and what can there be to negotiate about "week by week?"

A further list is given of towns in the Provinces in which it is said that "the Union is recognized by the Town Councils." I submit that this statement is most misleading; and it would be interesting to know definitely by what Town Councils, and how and under what circumstances the Gas Workers' Union has been "recognized?" Does the Union fix and decide wages and work, and determine who shall and shall not be employed? If not, in what manner is the Union recognized?

It has been more than once shown that this much-vaunted "Conciliation" Board, as suggested by the Union, is a fraud; and some of us have a lively recollection of the Gas Workers' Union being "recognized" some ten years ago in the promotion of strikes which resulted in semi-starvation to scores of women and children, and disaster to both men and masters—and all this after the demands of the Union had been granted and accepted, and afterwards repudiated by the Union officials.

C. N.

Jan. 3, 1900.

Gas Purification in Germany.

SIR,—In your last issue, an article appears, entitled: "Gas Supply in Germany—The Crefeld Works." While admirably illustrating the progress of German gas manufacture, it seems to give the erroneous impression that, instead of natural oxide, preparations, chiefly consisting of ferric oxide, are probably used in the Crefeld Works. I can authoritatively state that the Crefeld Works, and with them most of the German gas-works, use bog iron throughout.

The German gas manager, having long ago discarded lime as antiquated, knows how to make a distinction in the right direction between artificial oxide and bog iron ore, provided the latter be of the best quality. He is aware that the absorbing powers of a material containing hydrated oxide of iron to the extent of from 80 to 90 per cent. do not compare favourably with those of a material which naturally contains 70 to 75 per cent., provided the latter shows the other necessary factors for making a first-class purifying agent—a minutely fine distribution of the iron through all parts of the material, combined with large porosity. Another point to be considered is that in an artificial oxide, matter has to be introduced by the manufacturers to increase the looseness of the material. This has to be done at the cost of presenting a surface much less capable of receiving sulphuretted hydrogen or cyanides to the entering gas; for, of course, all the particles of loosening material (useless for purification proper) represent so much surface the less for matter capable of absorbing impurities. Even in bog ore, the porosity is not always sufficient, or the percentage of iron may be more than abundant, but unequally distributed. Yet it is, in my opinion, easy for the manager to select the right stuff by looking *primâ facie* not for an excessively large quantity of iron, but for the following three points: (1) The largest possible porosity, to prevent back-pressure. (2) A sufficient percentage of iron—say at least 70 per cent. or upwards of Fe_2O_3,H_2O. (3) A fine distribution of the iron, so as to secure absorbing power for the whole surface presented to the gas on entering the purifiers. Any material showing these three qualifications must produce the best result, if the working conditions of the plant are right.

Lime cannot, of course, be entirely done away with, where the elimination of the sulphur compounds is compulsory; but even when using a primary lime purifier with a first oxide purifier, and then a sulphided lime vessel to follow, the oxide residue is likely to show enough cyanides to effect a more advantageous sale than for its contents of sulphur; and certainly all works free of restriction ought to employ oxide throughout, and an additional lime purifier in the last position only where the elimination of carbonic acid is required. Thus the purification will be marked by the greatest simplicity, cleanliness, and economy.

ERNEST E. MEYER.

Nightingale Lane, S.W., Jan. 5, 1900.

LEGAL INTELLIGENCE.

THE RATING OF RESERVOIRS.

In the "JOURNAL" for the 5th ult., we reported the proceedings in the House of Lords before the Lord Chancellor and Lords Macnaghten and Robertson, in the case of *The Hampton Urban District Council v. The Southwark and Vauxhall Water Company*, in which their Lordships affirmed a decision of the Court of Appeal to the effect that a certain reservoir was to be regarded as "land covered with water" within the meaning of section 211, sub-section 1 (*b*), of the Public Health Act, 1875, and be rated at one-fourth of the net annual value. The bed of the reservoir in question was composed of a thick layer of concrete in an artificial excavation, and was surrounded by an embankment, lined with concrete, which rose above the natural level of the ground and retained the water. The Court of Summary Jurisdiction decided in favour of the District Council, and ordered the payment of the full amount claimed, but stated a case. The Divisional Court held that the point at issue was covered by previous decisions (*Regina v. Birmingham Water-Works Company, Newport Dock Company v. Newport Local Board*, and *East London Water-Works Company v. Leyton Sewer Authority*), and reversed the decision of the Court below. The Court of Appeal upheld the decision of the Divisional Court. It was argued by Sir Edward Clarke and Mr. Courthope Munroe, on behalf of the District Council, that the cases relied on were decided upon earlier statutes than the Act of 1875, and that, if they governed the construction of that Act, they were wrongly decided, and should be overruled. The exception in the sub-section cited, it was contended, applied only to land naturally covered with water, and not to an artificial construction such as the one in question. At the close of the arguments for the Council, their Lordships gave judgment without calling upon the representatives of the Company (Mr. Cripps, Q.C., and Mr. Ryde). The following is the text of the Lord Chancellor's judgment, as given in the "Law Times."

I think that if one applies oneself to the particular matter, and only to the particular matter which your Lordships have to decide in this appeal, it seems to me that the question, whether asked in a Court of Law or in the most popular assembly in the world, must come to this: Is a reservoir "land covered with water"? I think it is; and I have heard nothing which induces me to suppose that the Legislature used that phrase in any other or different sense from that in which I should understand it as one of the ordinary subjects of the Queen using his own mother tongue in the ordinary sense. This is "land covered with water," and it seems to me that it would be a very extraordinary thing indeed if, after the use of this language in this sense, not for 38 years only, but ever since the earlier period from which this phrase was derived, one was to find out some new and extraordinary mode of construing these words, which would prevent it from being what it is. It is land covered with water. And it is a remarkable thing that when it was put to the learned Counsel more than once: If a reservoir is not land covered with water, what is it? I heard no other reply to that question than the statement that it is a reservoir. It is manifest that what it is attempted to do here is to put into the language of the statute, by construction, words which are not there. The only other meaning alternative to that given to it by the Court of Appeal is that you must put into the statute, by construction, some such words as "land covered with water, which is not made land covered with water by an artificial construction," or some words to that purport and effect. What foundation there is for taking that liberty with the language of the Legislature, and putting into the statute words which are not there, I am wholly unable to understand. I confess that the thing which puzzles me most about this case is the doubts which appear to have been entertained by the two learned Judges below (Justices Wright and Darling). I have not the least notion what they mean. To my mind the language of the statute is extremely clear, and is not susceptible of ony other meaning than that which has been put upon it by the Court of Appeal. The one point which occurred to me as susceptible of doubt was the words which follow, and which Lord Justice Rigby has commented upon: "Or used only as a canal or towing path." At first sight that would seem curious, no doubt. If "land covered with water" was enough, why should they have put in the word "canal" too? And if the words "towing path" had not been added, I should have thought it really was curious; but I think the explanation which has been given is quite satisfactory. The thing which was to be rated was the adventure—the whole construction; and if the Legislature had not put in these words, this question upon the rating would have arisen: You have got to rate the canal itself—that is to say, that part of the earth on which the water rests—at one rate, and the towing path, which is only ancillary to it, and is only useful as making part of the artificial construction by which the adventure of the company is carried on, at a different rate. Therefore, for these obvious reasons, the Legislature have not contented themselves by simply abiding by the phrase "land covered with water," but have added to it "canal or towing path for the same." I am wholly unable to understand on what ground we are asked to disturb, or throw any doubt upon, the construction of these words which has prevailed for a very considerable period. Speaking for myself, I must say that I should feel very great hesitation upon such a question in attempting to overrule the judgments of the learned Judges in the cases which have been cited to us in the Court of Queen's Bench. That was peculiarly the Court in which rating cases were decided, and very often decided under circumstances in which there was no appeal; so that in many cases the decisions there were final. And three of those learned Judges were Judges of very great eminence, and especially familiar with questions of rating. I desire to say no more. I think this case is abundantly clear. In my opinion, your Lordships ought to dismiss the appeal with costs, and I move accordingly.

Claim in Respect of Damages Caused by the Honley Explosion.

At the Halifax County Court last Friday, before his Honour Judge Cadman, an action was brought by Benjamin Taylor, of Elland, to recover from his employers, Messrs. R. Dempster and Sons, Limited, under the Employers' Liability Act, the sum of £234 for injuries sustained by the explosion at the Honley Gas-Works on the 4th of July last. Mr. A. W. Bairstow appeared for the plaintiff; and Mr. A. Powell represented the defendants. The plaintiff's case, as stated by Mr. Bairstow, and deposed to by witnesses, was that he was employed by the defendants at 27s. per week wages. On the above-named day, he, with three other men and the foreman, went to the Honley Gas-Works, where Messrs. Dempster had contracted to take out an old gasholder. When the men arrived, they found that the water had not been pumped out, and an attempt was made with pumps to do this. The manhole at the side of the holder was not, however, opened during this process. Afterwards the men proceeded to take off a portion of the top of the holder, when a spark came in contact with some of the explosive mixture. Ignition resulted, followed by an explosion; the plaintiff being blown 40 feet into the air, and his fellow-workmen being killed. Mr. R. Porter, Engineer and Manager of the Elland Gas Company, in support of the claim, said that, in his opinion, the fault to which the explosion was due was in not thoroughly ventilating the holder before handing it over to the men. For the defence, Mr. Powell contended that the holder was not safe in any way for destruction. He urged that negligence on the part of the defendants had not been proved. They were right in relying upon the Gas Company for the clearing of the holder. His Honour held that the defendants' foreman was negligent in starting to work so shortly after the manhole had been opened and the plug taken out. He gave judgment in favour of the plaintiff, and awarded him £100 and costs.

MISCELLANEOUS NEWS.

MANCHESTER CORPORATION GAS SUPPLY.

The Widow and Family of the Late Mr. Stevenson—Advance in Workmen's Wages—Extension of the Carburetted Water-Gas Plant—The Quality of the Gas—The Sanitary Condition of the Works.

At the Meeting of the Manchester City Council last Wednesday—the LORD MAYOR (Mr. T. Briggs) presiding—some important recommendations from the Gas Committee came up for consideration.

Alderman GIBSON, in moving that the proceedings of the Gas Committee, of which he is Chairman, be approved, said he had to call attention to two or three matters of considerable importance. One of these related to the widow and family of the late Mr. Stevenson, their Chief Engineer. Of course, the members of the Council all knew that on the 30th of October last, owing to the stupid action of one of their own workmen, there was an explosion of gas at the Rochdale Road works, which was disastrous in its results, inasmuch as Mr. Stevenson, who stood in the very forefront, carefully watching the operations going on, was the first to receive the full blast of the explosion, and was practically killed on the spot. No sympathy or recognition on their part, no act of theirs, could in the slightest degree recompense Mrs. Stevenson for the loss of her husband; but they could, at least in some measure, lighten the severity of the consequences by acting in what he conceived to be a fair, and probably generous, way towards her. To his mind, the matter presented two aspects—the legal and the moral. He was not, however, going to stay to inquire whether or not Mrs. Stevenson had any claim or ground of action against them, or what a jury might award. He preferred dealing with the question from the moral point of view; and he would ask "what they, as a large and prosperous Committee of a wealthy Corporation, ought to do under the circumstances. He should like to call attention to one or two facts. What would have happened if they had not had Mr. Stevenson, or some other equally competent man, in their service? In 1894, they borrowed £500,000, and had employed it during the past five years in developing the resources of the gas undertaking. The great proportion of this money was spent in accordance with designs and specifications prepared by Mr. Stevenson, and under his direct control and supervision. What would have been their position if he had not been there, and they had been forced to pay an expert, as had been necessary on many previous occasions? Many members of the Council would remember that before Mr. Stevenson's services were secured, the Gas Committee paid considerably over £2000 for the supervision of the construction of various works; and he had no hesitation in saying that if they had not had their late Engineer, or some other equally competent one, they would have had to spend anything between £12,000 and £15,000, which that gentleman had saved them by his competency and knowledge. What the Committee proposed was—"That the sum of £5000 be granted and paid out of the revenue account of this Committee for the benefit of the widow and family of the late George Ernest Stevenson, Engineer of the Gas Department, who was killed in an explosion at the Rochdale Road Gas-Works on the 30th of October last; such sum to be in settlement of all claims against the Corporation, and to be invested in the names of Trustees to be approved by this Committee in a £3 per cent. gas mortgage of the city rate, the interest to be paid to Mrs. Stevenson until her death or re-marriage, and the principal to be then divided among the children of Mr. Stevenson, including the issue of any child who may be dead, such issue taking their parent's share." It had been said, and it might be said, that they were proposing to pay more in this case than they would pay in that of an ordinary workmen. They must, however, remember, that while they were, of course, doing so, they were not paying more in proportion. No ordinary workman would have done for them what Mr. Stevenson had done. No ordinary workman could have saved for them £10,000 to £15,000. They paid Mr. Stevenson, while he was alive, in proportion to his work and ability; and in his (Alderman Gibson's) judgment, it was only just and fair that, seeing he was killed in their service, they should recompense his family in the same manner as they had paid him for his work, and in the same proportion. (Cries of "Agreed.") The next matter to which he desired to draw attention was that of the workmen's wages. The Committee recommended that the wages of all workmen employed in the Gas Department, other than artisans to whom Trade Union rates were paid, should be advanced at a uniform rate of 5 per cent., as from Jan. 1. This meant dividing among the workmen about £6000 a year. He should like to say that the question of advancing wages at all was suggested to the Committee by the Gas Workers' Union. He had no quarrel with Trade Unions; for, when properly conducted, they were of great value. It was only when the Secretaries of Unions told them not only what they ought to do, but what they should and should not do, that he personally would come into conflict with them. He was always delighted, and so were the Committee, to receive any advice; but they did not want any instruction. They proposed to give a 5 per cent. advance all round, which meant that they did not recognize whether or not the men belonged to a Trade Union, but only considered whether they were doing their work faithfully and well. If so, they were entitled to consideration at the hands of the Committee, whether they were members of an organization or not. The Committee did not want to prevent them from joining a Union; but they would not discharge them if they did not join one. Certain members of the Council had been somewhat exercised in their minds because there had been a discrepancy in the amount of money paid at the various stations for the same work—one rate at Rochdale Road, another at Bradford Road, and another at Gaythorn. There had certainly been an anomaly in this respect; but it had been remedied. On the previous day, the Committee had had an interview with some of the principal men from all the stations. They explained the position, and the Committee stated what they were prepared to do; and the men went away rejoicing. The members of the Council would further see that the Committee had accepted a tender for the extension of the carburetted water-gas plant at Bradford Road to the full capacity of the existing house—viz., 6 million cubic feet per day. At present they were only making 3 million cubic feet. When this was completed, they would, no doubt, be able to cope very fairly with the great increase that they now found was gradually taking place in the gas consumption in the city. It was very strange how, in spite of the competition of the electric light which must influence them in some way, there was a continued growth of the gas undertaking. They hoped that the enlarged plant would be ready for next winter. There had been some grumbling about the gas. It was a very extraordinary thing that, notwithstanding the Committee had reduced the price of gas during the last four years, and practically made the people a present of £50,000 a year, and supplied them with splendid gas—(Cries of "Question")—yes, splendid gas, of high illuminating power, at an extraordinarily low price, for 360 days in the year, without any complaint at all being heard, yet when a little fog came on the people forgot the great benefits they had enjoyed, and began to grumble. He could only say he was very much surprised that not only some of the public, but certain authorities seemed to forget the great efforts made for the promotion of the best interests of those whom they represented, and assumed that the Manchester Gas Committee were either the most incompetent or the most dishonest Committee that ever existed in that or any other Corporation. (Laughter.) He begged to move that the minutes of the Committee be adopted.

The LORD MAYOR seconded the motion.

Mr. BOYLE said he did not desire to quarrel with the decision of the Committee with regard to Mr. Stevenson, of which he quite approved, and he did not want to strike a jarring note. He wished, however, to say that the only fault he had to find was with respect to the policy pursued when the people who were injured were of lower standing than the late Mr. Stevenson. Would it not be better if the same kindly feeling could be extended in such cases, instead of legal proceedings having to be taken to enforce on the Committee the payment of the little instalments that were paid to the widows of men who were killed? If the Committee would face their responsibilities in such cases, and meet them in the same spirit as that which they had shown in connection with Mr. Stevenson, it would be much more satisfactory. What was the policy of the Committee with regard to workmen who had been injured in the course of their employment, and who had received a little compensation, but who, when they had recovered, were refused work by the Committee? Was it by the sanction of the Committee that men in this position were denied employment by the department.

Mr. BROCKLEHURST remarked that he, too, did not wish to quarrel with the Committee's recommendation, but to say a word as to the policy pursued towards the workmen. As Mr. Boyle had pointed out, there had in the past been a difference in the methods of treatment adopted in the case of their well-paid and lower-paid servants. A short time back, he pointed out that some workmen who had been injured were not being paid the amount to which they were entitled under the Workmen's Compensation Act. He was glad to find that since this had been brought to the notice of the Committee, a different policy had been pursued; but, as Mr. Boyle had suggested, it did not seem right that men should have to go to the trouble of taking legal proceedings to obtain what was readily and wisely granted to the widows and relatives of those in a superior position. With respect to the workmen's application, the Chairman of the Committee rather complained of the way the workmen's case was presented, and seemed to look on their intervention as a dictation.

Alderman GIBSON: Not at all. I thought it only fair and just. I explained that we should never have thought anything about wages if it had not been suggested by the Workmen's Unions. Therefore, I think I gave them credit for having done good work for those they represent.

Mr. BROCKLEHURST said he was pleased to have this confession. The Gas Workers' Union had been of immense service in raising the wages of the whole of the workers employed in the manufacture of gas. He wanted to mention the question brought forward a short time ago, as to the treatment of members of the Union by responsible officials. One of their Superintendents had taken action with regard to members of the Union which, whether rightly or wrongly, had produced the impression that he was intimidating them from remaining in the Union. He hoped that, whatever might happen in the future, no such action would be taken, or allowed to be taken, by responsible officials of the Gas Department. He should also like to refer to another matter. He had recently visited the Gaythorn works, and found there was an almost complete absence of sanitary arrangements for the men employed by the Committee. He was going to say that the sanitary condition of the works was a disgrace—it was certainly not a credit—to the Gas Committee. He had seen other works which were models of their kind, and which might be imitated. He hoped this and various other important questions, as well as that of wages, would be taken into careful consideration by the Committee.

Mr. JOHNSON remarked that Alderman Gibson had mentioned the legal aspect of Mr. Stevenson's case, but had not gone into it. He (the speaker) would like to know, if Mr. Stevenson's family were entitled to compensation, what would be the amount under the Employers' Liability Act. Also, if in future the Committee intended to make this a precedent, whether all the workpeople employed by the Committee would be treated on the same liberal lines as those adopted in the present instance.

Alderman GIBSON said he had heard with regret Mr. Boyle's observation respecting money having to be forced out of the Committee by legal proceedings. He might tell Mr. Boyle and others that he (the speaker) had done all that one person could do to tell these people how much better they would be served if they came to the Committee instead of going to a lawyer. In the case of the last man they had to deal with, his own lawyer admitted that he was acting foolishly. He preferred £75 to a job at 25s. or 30s. a week, on light work.

Mr. BOYLE observed that he had been referring to the survivors of men who had been killed, not those who were able to go to work again.

Alderman GIBSON said there had not been very many killed, and he should like to know of any instance where it had been necessary to use force to cause him to do that which was just. Could Mr. Boyle point out any particular case? Every member of the Gas Committee was desirous of doing the very best he could for the men, their widows, and others whom they left behind. As to Mr. Brocklehurst's remarks, the "model" works alluded to were, no doubt, those at Leicester. They could not have such works in Manchester. He admitted that there was perfect justice in what Mr. Brocklehurst had said with regard to the Manchester works; and the question was having his consideration. They could not do for their men here what had been done in Leicester; but a good

deal more could be done than had been, and it ought to have been done. Why had it not been done? The reason was that the Chairman and the members of the Committee had not been workers in a gas-station, and had no knowledge of these little matters. Many of the things referred to by Mr. Brocklehurst were right and proper, and should be carried out, so far as he could influence matters; and he thought the Committee would support him.

The minutes of the Committee were then adopted.

It may be added that Alderman Gibson had prepared a few particulars, which he did not read at the meeting, to show how, in spite of the competition of the electric light, the gas undertaking had grown. These particulars showed that, in 1894, 360,000 tons of coal were carbonized, and last year the quantity had risen to 426,000 tons—one ton of coal producing 10,000 cubic feet of gas. In 1896, the price of gas was reduced 3d. per 1000 cubic feet, and meter-rents were abolished at a loss of revenue of £50,000 a year. In 1895, the revenue was £567,000; in 1896, when the allowance was made, it dropped to £510,000; in 1897, it rose to £552,000; in 1898, to £553,000; and last year to £595,000—showing that the department had recouped themselves for the loss of the £50,000 in a little less than three years.

Mr. Stevenson's Successor.

At a meeting of the Gas Committee of the Corporation held on Friday, the question of the appointment of an Engineer to the Gas Department, in succession to the late Mr. Stevenson, was brought up for further consideration. At a previous meeting, held on the 8th ult., a Special Sub-Committee was appointed to report upon the applications received for the vacant post. The total number was sixteen, and four of these were selected from which to make a final choice. The Committee ultimately decided to recommend to the Council that Mr. J. G. Newbigging, Engineer and Manager of the Macclesfield Gas-Works, be appointed Engineer, and to take the management of the Rochdale Road Works for the time being. As most of our readers are aware, Mr. J. G. Newbigging is a son of Mr. Thomas Newbigging; and his salary as Manager of the Macclesfield works is £300 per annum, in addition to which he has a consulting practice. The post of Gas Engineer to the Manchester Corporation is worth £800 a year. The appointment will, of course, have to be confirmed by the Council. It may be mentioned that Mr. James Hill, Deputy-Manager of the Rochdale Road works, who was injured in the recent explosion, is still too unwell to attend to his duties. The Committee also received a deputation from the Withington District Council, headed by Mr. Blair, the Chairman. In the course of the interview, it was stated, on behalf of the deputation, that there had been a great many complaints respecting the gas supply, but that the quality and quantity of the light had recently been very much improved.

THE FATAL EXPLOSION AT THE DOUGLAS GAS-WORKS.

In the "JOURNAL" last week, we gave an account of the disastrous explosion which took place at the Douglas (Isle of Man) Gas-Works on the 22nd ult., and also a condensed report of the proceedings at the inquest. We are now in a position to notice them at greater length.

After the inquiry had been formally opened on the 23rd ult., and evidence of identification taken, the Jury visited the scene of the explosion, where they were met by several Directors of the Company, the Secretary and Manager (Mr. C. H. Kay), and their Advocate (Mr. J. M. Cruickshank). At the request of the High Bailiff, Mr. Kay explained the surroundings and the circumstances of the disaster, and said the entire damage was caused by the explosion of the ammoniacal liquor tank. The men Baird and Coole were in the employ of Messrs. Knox, and were fixing up a new pump by the scrubber. Mudie was in the Company's service, and practically had charge of the yard. The job was being done by day-work. Mr. Cruickshank said his instructions were to afford the High Bailiff and the Jury every possible facility for coming to a conclusion on the matter. He added that the Directors deeply deplored the loss of life which had occurred, and sincerely sympathized with the relatives of the dead men.

The inquiry was resumed on the following Wednesday, when, after the two medical men who had rendered assistance (Drs. Mackenzie and Marshall) had given evidence, Mr. Thomas Newbigging, the Company's Consulting Engineer, was called. He said he had acted in this capacity for about 17 years, during which time he had reconstructed the greater portion of the works. The two tar and liquor tanks were the only parts with which he had not had to deal. At one time, each of the two tanks contained a gasholder; but about 18 or 19 years ago, when the larger holders were erected, these two smaller ones were dispensed with, and the tanks were converted into storage wells for the tar and ammoniacal liquor. This was the practice in gas-works everywhere. Most of the gas-works throughout the kingdom had similar tanks, covered in a precisely similar way—that was to say, the roof was formed of brick arches, springing from cast-iron or rolled-iron girders or beams, which were supported on the tank wall and by brick piers built up from the bottom. The position of these tanks was the best that could be chosen. They were in a space at the back of a range of buildings, separating them from the retort-house and from the yard where most of the operations of gas making were carried on. They were also at the extreme end of the site from the gasholders. The use of lights in this portion of the works by the men employed by the Company was, he was well aware, strictly forbidden, as he had been told so by the men themselves. When the make of gas was heavy, as it was in midwinter, the tar and liquor came away at a high temperature. The lighter hydrocarbons were given off in a state of vapour, and when mixed with air were highly explosive. This was the condition of things when the explosion took place. It was this mixture of air and hydrocarbon vapour or gas which, on being fired by a light, produced the explosion. There could not be any spontaneous combustion. The gas would come through the manholes in the crown of the liquor-tank. There were two of them, each closed by a perforated grid. The light would have to be brought near to the outlet or manhole, before an explosion could take place. The tank was 14 feet deep. It would have tar at the bottom, then ammoniacal liquor above it, and gas floating on the top. A hot cinder would not ignite gas; it must be a flame or a very white light. Nor would smoking ignite it; but lighting a pipe with a match would. He should think a light would have to be within about a foot of the manhole for the vapour to ignite. He believed it was about 8 or 9 feet from the manhole to the pumps where the men were working. He spoke from experience and knowledge when he said that the management of the Douglas Gas-Works was of the best. He was always at the call of the Directors when they wished to see him. Mr. Kay had managed the works with distinction for many years, and with entire immunity from accidents until now. In his opinion, Mr. Kay had a thoroughly practical knowledge of gas plant, and had served a good apprenticeship, having been on the works since he was fifteen years of age. There was no necessity for using a light, as the work could all have been done in the daytime. In his view, the men were hurrying over it to get it done before the holidays. It was possible to put ventilating shafts into tar and liquor tanks. He always put them in when he constructed works of the kind; but at the majority of gas-works the ventilation was effected in a way similar to that at Douglas. His attention had not been drawn to the two tanks, which were the only remnants of the old works in existence. They were not defective. They were well covered; but the ventilation might have been better. Covered lamps were used on the works, but no safety lamps. It was not customary to use safety-lamps in gas-works; but it would be better if it were. It would be desirable, in any alteration, that the ventilation of these tanks should be improved by fitting shafts at suitable points, and of sufficient height to carry the gas over the buildings. He thought this would prevent the occurrence of such accidents as the one which they were investigating. Only about 20 per cent. of the gas-works had ventilation by means of shafts; but certainly it ought to be generally adopted. At the close of Mr. Newbigging's evidence, he was thanked by the High Bailiff for the satisfactory manner in which he had given it, as he had shown no bias whatever.

The next witness was Mr. Kay. He said he had been engaged upon the works for 25 years; and had been Secretary since 1886, and Manager since 1894. He was perfectly acquainted with the plant all through. The two tanks were converted in 1881, shortly after which time Mr. Newbigging became the Company's Consulting Engineer. There were no definite instructions on this occasion, but it was a strict rule given to all the Company's workmen that no naked light was to be used in the tar-yard or at the purifiers. The instructions were not posted up; but they were well understood by all the men. Mudie was the yard foreman, and he knew the rules. On the day of the accident he was in charge of the yard. He (witness) was not aware of any reason for the men working after dark; and, as a matter of fact, he did not know they were doing so, as he was away at tea when the accident happened. He was back at the works, however, by a quarter to six. One of the men who was working at the pump—John Coole—was formerly in the employ of the Gas Company, and he would know of the rule prohibiting lights in the tar-yard. It was ten or twelve years since Coole left their service. He (witness) could not say that any of the men were positively warned. He agreed with Mr. Newbigging as to the immediate cause of the accident. Mudie had been with the Company about twenty years, and if he saw a naked light in the tar-yard it would have been his duty to forbid it. The lamp used by Mudie was an ordinary closed one with a glass window. As a rule, smoking was prohibited; but in the yard in question this was not notified.

Alfred Hughes, an apprentice to Messrs. Knox, who was working with the men fitting up the pump, said that after dark, on the day of the accident, he saw Mudie standing over Baird with a lighted lamp, which he (witness) had obtained the previous day from the weighing office. It was a small moulders' light—a "duck" light—and nothing was said to him, or in his hearing, against using it. He was sent to another part of the works, and while there the explosion occurred. Nobody told him it was dangerous to take a naked light near the tank. [During the witness's evidence, a lamp similar to the one which it was thought had caused the explosion was produced. It was constructed of metal, and the wick protruded from the end of a spout.] Thomas Moore, a blacksmith in the employ of the Company, stated that he saw Hughes with the "duck" lamp unlighted in his hand, and told him he had better not take it to the place where they were working. He thought Hughes must have heard him. He (witness) knew the danger of naked lights; the Manager having warned him of it. They used a covered light when they went at night to examine the working of the pumps. A labourer named Cunningham said he heard Moore caution Hughes about the light; and Joseph Boyd, who was in charge of the weighing-house, deposed to giving Hughes the "duck" lamp, but said the lad did not mention where he was going with it. After two other witnesses had been called, the evidence was completed.

In summing up, the High Bailiff reminded the Jury that their duty was to find out the cause of the death of these men. The evidence was conclusive that they lost their lives in the explosion that took place—from shock and suffocation. They had also to consider the surroundings of the accident. Dealing with the question of management, he alluded to Mr. Kay's unblemished character as Secretary of the Company, but said it might, perhaps, be found necessary now that there should be a Manager as well. After again complimenting Mr. Newbigging on the unbiassed manner in which he had given his evidence, he said that had it not been for this evidence being tendered in so straightforward a manner, he would have been obliged to apply to the Governor to appoint an independent expert. Referring to the instructions alleged to have been given with reference to lights, he said he could not imagine that rules and regulations governing the lives of men employed in the gas-works should be conveyed simply by word of mouth. There ought to be a notice posted up in different places, such as was done in mines under the Metalliferous Mines Act. Messrs. Knox's men seemed to have been proceeding with their work unknown to the Directors or the Manager. The evidence given went to show that it was an open duck lamp that was used. Whether this was done with the knowledge of the Manager or not, was a question for the Jury to consider. Probably it was not used with his personal knowledge; but a Manager's responsibility did not end there. Was he simply to go home to his tea, and allow things to go as they pleased? It was his duty to see that there was a proper person left in charge. Otherwise, it would be very serious if a Manager was not to see that all the rules and regulations of the Company were attended to in his absence. It was clear there was carelessness on the part of somebody,

though he was not going to say it was culpable carelessness. It was very difficult to say how far a man was liable or culpable for his carelessness. That was the question for the Jury; and they were in a position to make such suggestions as they thought best to secure the safety of lives in future. Mr. Newbigging had recommended the ventilation of the tanks by means of shafts; and the recommendation would not be lost sight of by the public, even if it were not carried out by the Company. He referred to the sad bereavements caused by the disaster, and expressed the opinion that it was the duty of the Company to see that support was given to the widows and children of the unfortunate men who had lost their lives.

The Jury deliberated for nearly an hour, and returned a verdict to the effect that the deaths of the three men had been caused by shock and suffocation resulting from an explosion caused by the careless use of a naked light in the tar-yard, with the knowledge of the foreman of that part of the works. They attached to the verdict a recommendation that notices should be posted up, in a prominent position, in the works, as to the danger of using naked lights in the dangerous parts of the works; and that none but safety lamps ought to be used in the future in those places, as there had evidently been carelessness in the past management with regard to the use of lights. They further recommended that the tanks should in future be ventilated with shafts rising to a sufficient height in the air to avoid the risk of an explosion. The High Bailiff said the verdict was a very sensible one, and the rider at the foot of it such as he should have wished inserted if he had been on the Jury. He expressed the hope that it would be carried out. Mr. Cruickshank, on behalf of the Company, gave an undertaking that this would be done.

In view of the remarks of the High Bailiff at the inquiry reported above, it is satisfactory to find that the Directors of the Company have determined to provide for the widows and children left by the men Mudie, Coole, and Baird. Last Thursday, the Directors and their legal adviser met the widows, and gave a voluntary written undertaking to pay them each 10s. a week for life, or as long as they remained widowed, and 2s. 6d. a week for each child.

THE ROYAL AQUARIUM GAS EXHIBITION.

West's Patent Coke-Conveyors and Compressed-Air Motors.

There are a few points about two of the exhibits on the stand of West's Gas Improvement Company, Limited, at the Royal Aquarium Gas Exhibition, to which further attention may be called. Since the first visit of our representative, we have been informed that West's patent "Silent" coke-conveyor, of which a beautifully finished model is shown, is now being extensively adopted in gas-works. The chief characteristics of the conveyor are: It consists of an endless chain, which travels along the centre of a U, or other shaped, trough; the chain being provided with arms or scrapers, which, when drawn along the trough, will convey the coke or other materials deposited on the trough to any required point, where it may be discharged through outlets provided in the trough, or off at the end of the conveyor. It is fitted with Hunt's patent roller chain, which is specially adapted for dealing with gritty material, as the rollers prevent excessive wear and tear of the chain-wheels. It will be seen by a glance at the model that the wearing parts are specially designed; and, it has been proved in practice that the wear and tear is remarkably small. The conveyors do not break up the coke or make breeze, as the coke does not roll over in its passage along the conveyor, and no violent rubbing of the pieces against one another occurs. They are suitable for conveying coke from both horizontal and inclined retorts. This type of conveyor has been working some time at the Gaythorn Gas-Works of the Manchester Corporation; and we understand that it has been giving excellent results. We are also told that the Company have in hand a large contract for coke plant for the Nottingham Corporation Gas-Works, to the designs of the Engineer (Mr. W. R. Chester, M.Inst.C.E.). The motors on view are West's 4½-inch and 3½-inch double-cylinder compressed-air motors. They are fitted with Joy's patent reversing gear, and have all the working parts protected from dust; special attention being given to lubrication. The motors have been carefully tested by Professor Goodman, Assoc.M.Inst.C.E., of the Yorkshire College, Leeds, who remarked on the "immense superiority of the West motor over those of the three-cylinder type." He has, he states, tested it in conjunction with three-cylinder motors, and found that it only uses from one-third to one-quarter the quantity of air the others did in doing the same work, or, in other words, it did three to four times as much work with a given quantity of air in comparison with the others. The motors are used for driving West's compressed-air charging machinery, and a smaller type for the drawing machinery; also for hauling coke trucks and waggons, lifting purifier-covers, and many other purposes in gas and electric light works.

The Van Vriesland Ærogene Gas and Denayrouze Light Syndicate's Exhibit.

The extensive character of the combined exhibit of the Denayrouze Gas-Light Syndicate and the "Ærogene" incandescent gas-light somewhat belated its completion, and prevented full justice being done to it in our general notice of the exhibition last week. A few days since witnessed the perfecting of the installation of the lights and apparatus; and now we have pleasure in calling further attention to it.

Before specifically referring, however, to this demonstration of the value of these lighting systems, some particulars may be given (from printed information supplied) of the Van Vriesland ærogene gas. It is pointed out that it brings within reach of places not provided with ordinary gas-works, all the advantages of the incandescent light. In order that an apparatus intended to produce ærogene gas may be practically applied on a large scale, it is necessary that it fulfils a certain number of conditions, among others: "(1) Uniform and constant carburation in such a manner as to give a perfectly natural gas, burning without any variation of strength or flickerings of the flame. (2) Sufficient pressure to admit of distributing vertically, as well as horizontally, a gas which is heavier than air. (3) Absence of condensation of the carburetted liquid, or of impurities in the gas-pipes. (4) Self-regulation of the apparatus—that is to say, that it ought to be able itself to regulate its production of gas in such a way as to light or extinguish any particular number of jets without altering the strength of the flames of other jets. (5) Simplicity and strength in an apparatus intended not only for domestic purposes, but for public lighting." It is in face of these difficulties that, it is asserted, all previous systems have failed; and the Van Vriesland system has shown its superiority by having successfully solved them. The apparatus charges cold air with the vapours of suitable hydrocarbons, brings the mixture up to the required pressure, and is worked from a central place, whence it supplies gas suitable for incandescent burners, without any element of danger. It has been worked with benzol of ·880 specific gravity, benzene of ·700 specific gravity, and gasoline of ·650 specific gravity; and the gas produced has been freely used both in gas-engines and as an illuminating agent for incandescent burners. A gallon of gasoline of ·650 specific gravity, converted into ærogene, and used in incandescent burners, will, it is claimed, give 5000 candle-hours. A flame of 35 candles therefore burns 143 hours on one gallon of gasoline; and the cost of the gasoline being 1s. 8d. per gallon, it works out to 0·14d. per hour, which shows a very economical result. As the gas issues from the burners at a high velocity, no glass or other chimneys are necessary for enclosing the mantles; and the temperature of the flame being high, exceedingly small mantles may be used. Among other claims advanced for the apparatus are these: Being rotary, the pressure it gives is very regular. As it is fed automatically in exact proportion to its use of hydrocarbon, the gas produced has a constant composition. It is hermetically closed, so that no gas can escape from it—ensuring absolute safety. It produces no more gas than is required; when all gas consumption stops, the production of gas ceases at the same time. The apparatus requires very little driving power, and may be operated by any motor—viz., a weight raised by hand, clockwork with a spring, a small water-motor, or a small hot-air or gas engine. It occupies very little space; and its cost is moderate. For example, an apparatus capable of feeding 45 burners of 35-candle power each only requires a space of 5ft. by 3ft. Owing to its simplicity, the apparatus also possesses extraordinary strength. These are points of importance, especially in apparatus which is intended for application in private lighting. In Switzerland, ærogene gas has been adopted for the lighting of several railway stations; in Holland the village of Breukelen is lighted with it; and at a milk sugar works at Uitgeert, it is employed for driving a 10-horse power gas-engine. The gas may also be utilized for domestic and industrial heating; and, according to the following statement, with very great advantage: In the gold-refining works of Geneva, by its means, in a Perrot stove, a casting (melting) of 4 kilos. of gold has been obtained at an expense of about 30 centimes in three-quarters of an hour. With ordinary gas, the expense is 80 centimes; and the same work requires an hour and a quarter. In this country, the Denayrouze Light Syndicate has carried out an extensive installation of the Van Vriesland system at Brocklesby Station (Lincs.) on the Great Central Railway; and, from the same plant, gas is supplied to Ulceby Station (¾ mile distant) and to Habrough Station (1¾ miles away). From actual experiments, we are told, the cost of light used at the three stations amounts to, as nearly as possible, 2s. per 1000 cubic feet. As may be seen at the exhibition, the Van Vriesland carburettor can also be used for raising the pressure of ordinary gas for intensified gas lighting. This is simply accomplished by placing water in the carburettor instead of gasoline, connecting the gas supply to the air-inlet, and passing the gas through the apparatus to the same outlet as when used for oil gas. In this way, the pressure can be raised to any desired point by speed regulation.

With this general statement as to the merits ascribed to the ærogene gas system, we will turn to the exhibit, which will be found in the north-west gallery of the Aquarium. There a suite of spacious apartments has been constructed, to show the actual effect of interior illumination by, chiefly, Bandsept burners supplied by both ærogene gas and coal gas under pressure. In all there are three rooms, an entrance hall, and machinery-room. The former are luxuriously furnished and decorated—in fact, in such rich style that there is a danger of the furniture and other appointments receiving as much attention from the casual visitor as the lighting arrangements themselves. But, of course, this will not be so in the case of the gas engineers and managers, and lighting superintendents who may visit the exhibit, and who will, with us, recognize that the exhibitors have made an admirable disposition of their lighting arrangements, and have secured a very pleasing and brilliant effect. Taking the rooms in the order in which they are visited, there is first the entrance hall, which is illuminated by a very artistically designed chandelier in the centre. It supports, in tiers, eighteen No. 1 Kern burners, and is supplied with the ærogene gas. One thing that will particularly strike the visitor about the rooms illuminated by this gas is that the light is beautifully soft; and even with an aggregation of lights in one spot, as in the entrance hall, the eyes do not suffer the slightest irritation. The first room is a splendid apartment, 40 feet square; and this is also supplied with ærogene gas. It is lighted by sixteen 3-light brackets disposed round the walls, and fitted with small Bandsept "Torch" burners. The second apartment (which is of smaller dimensions) is illuminated by a central pendant fitted with large "Torch" burners of 250-candle power; and the third room is fitted with eleven brackets, each supporting two small "Torch" burners. In all three apartments, a very effective display is made. The machinery-room will be an attractive feature for the professional visitor. A photometer-room is being fitted up; and lamps are being put into position containing various sized clusters of Bandsept burners, suitable for public lighting, and supplied with both coal gas and ærogene gas. Last week, the room was powerfully illuminated by a cluster of five Bandsept lights. A number of Bandsept burners are also available for close inspection; and a model of the Van Vriesland plant already referred to as being in use at Breukelen will claim attention. Interest will also be shown in one of the carburettors in operation as a pressure-raiser for ordinary coal gas. It is capable of increasing the pressure of the gas to 18 inches; but, of course, it can be regulated to any lower pressure—9 inches being about the pressure usually worked to. Overhanging the north-west gallery may be seen four clusters of three-light Bandsept burners of 250-candle power each, supplied by gas the pressure of which has been raised by this apparatus. As will be observed, its internal parts are simple; and their operation proceeds noiselessly and smoothly. Time will not be wasted in an inspection of the lighting arrangements and objects of interest to which we have referred, and which have been brought together by the Denayrouze Light Syndicate.

THE BRIGG AND SKIPTON ARBITRATIONS.

Mr. George Livesey, the Umpire in the Brigg Gas-Works purchase arbitration, has issued the joint award of himself and the two Arbitrators in the case, Messrs. H. E. Jones and E. H. Stevenson. It is for £24,300. The claim made by the Company's expert witnesses was £28,134, and for surplus works £1902; making a total (including 10 per cent. for compulsory purchase) of £30,036. The Council's expert witnesses gave the value of the works at £17,886, and excess works at £712, or a total of £18,598, excluding the 10 per cent.; or, if the 10 per cent. be added, a total of £20,457. The income claimed by the witnesses on behalf of the Company was £959. Deducting the Company's claim for excess works of £1902, the award works out at 23·35 years' purchase of the income claimed by the Company. There was no borrowed money.

The statement made in the "JOURNAL" for Dec. 19 regarding the Skipton award requires a little amendment. The following are the figures taken from the shorthand notes: Claim by the Company's witnesses, including excess works, £82,746; by the Council's witnesses, including excess works, £49,674. The award was £66,500. To each of these sums has to be added £4750 for the mortgage taken over by the Council. The income claimed by the Company, after deducting interest on the mortgage debt, was £3049; and the award works out at 21·8 years' purchase of this income of £3049. At a meeting of the Skipton Council on Thursday, it was reported that the undertaking of the Company had been formally taken over, and that a cheque for the amount of the award had been paid.

The following claims for compensation have been put in by officials of the Brigg Gas Company: Mr. G. Jack, Manager, £1721; Mr. F. C. Hett, Secretary, £562; Mr. C. Clark, Collector, £753; Mr. C. E. Torry, Auditor, £51. With the view of effecting a compromise, the Council have decided to make the following offers to the respective claimants: Mr. Jack, £400; Mr. Clark, £135; and Mr. Hett, £200—the claim of Mr. Torry being altogether ignored.

AMERICAN COAL-GAS STATISTICS.

Our American contemporary "Progressive Age" has been favoured with an advance copy of the portion of the twentieth annual report of the United States Geological Survey, which contains statistics relating to illuminating and fuel gas and residual products. The following table, given in their number for the 15th ult., has been compiled from them.

States.	Companies; number reporting.	Coal carbonised; total	Coal Gas.						Tar.			Coke.			Ammoniacal liquor.	Gas, coke, tar and ammonia.
			Gas made.		Kind.		Average price.		Quantity; total.	Price per gallon.	Yield per ton coal.	Quantity; total.	Price per ton.	Yield per ton coal.		
			Total.	Per ton coal.	Illuminat'g	Fuel.	Illuminating.	Fuel.								Total value.
		Short tons.	Cubic feet.	Cu. ft.	%	%			Gallons.	Cts.	Gallons.	Short tons.		Per cent.	Value.	
Alabama	9	16,929	105,941,100	6,258	84	16	$1.74	$1.33	166,810	4.87	9.86	10,140	$3.295	59.9	....	$205,039
Arkansas	3	3,300	26,673,200	8,083	80	20	2.00	1.43	39,500	6.82	11.97	2,160	3.303	65.5	....	60,140
California	26	27,740	266,904,824	9,622	82	18	2.17	1.87	272,448	6.12	10.12	16,471	9.167	59.6	....	710,724
Colorado	4	16,931	154,990,300	9.154	75	25	1.53	1.03	192,900	5.60	10.00	9,948	3.764	65.1	$1,367	263,418
Connecticut	7	42,751	429,509,570	9,908	77	23	1.34	1.03	438,476	5.88	9.39	28,298	3.639	63.8	2,989	637,274
Delaware	3	6,458	58,736,800	9,095	75	25	1.04	1.03	133,000	4.33	12.16	4,134	2.624	64.0	1,000	78,893
Georgia	8	23,870	202,635,900	8,489	70	30	1.31	1.08	262,911	4.19	11.25	15,532	4.003	64.7	36,176	357,719
Illinois	26	55,850	508,561,350	9,106	67	33	1.33	1.16	674,758	3.08	11.51	34,280	3.291	61.4	3,163	724,498
Indiana	20	55,344	512,375,912	9,258	80	20	1.35	1.01	624,482	2.23	10.36	31,175	2.766	56.3	4,577	701,634
Iowa	13	19,657	184,677,047	9,106	70	30	1.54	1.39	224,010	3.99	10.04	12,157	4.464	58 3	....	322,382
Kansas	9	17,529	149,879,866	8,550	80	20	1.48	1.34	176,830	4.34	10.66	10,294	3.630	62.1	....	239,164
Kentucky	9	49,386	466,912,000	9.454	80	20	1.37	0.82	592,400	2.64	12.00	29,567	2.563	59.9	836	595,042
La. and Miss.	3	3,009	23,342,601	7,758	82	18	1.83	1.50	23,619	6.51	7.85	1,835	3.559	61 0	....	41,062
Maine	5	9,934	129,674,270	9,828	89	11	1.36	1.31	134,615	5.27	12.66	6,634	4.023	66.9	1,081	191,852
Md. and D. C.	5	7,639	70,090,400	9,175	94	6	1.40	1.12	106,100	3.78	13.89	4,721	2,325	61.8	25,715	137,553
Massachusetts	45	179,706	1,788,133,565	9,950	93	7	1.28	1.20	2,518,219	5.36	14.30	115,980	3.618	64.5	18,788	2,674,032
Michigan	21	56,882	536,570,736	9.433	64	36	1.19	0.98	685,589	3.65	11.51	46,480	3.491	63.6	10,264	734,548
Minn. and Neb.	4	16,038	178,599,000	9.547	86	14	1.40	1.33	181,564	2.82	11.32	9,809	4.167	58.5	....	282,695
Missouri	20	124,518	1,131,978,890	9,091	68	32	2.06	0.86	267,905	5.14	10.41	14,663	3.139	57.0	....	1,180,099
Mont. & N.Mex.	3	5,031	42,584,900	8,465	70	30	2.17	1.97	40,548	10.17	8.06	3,027	4.606	60.2	....	94,859
Nevada	3	815	6,939,900	8,515	98	2	4.48	2.97	8,750	9.09	10.74	363	14.168	44.5	....	36,825
N. Hampshire	4	13,160	125,419,893	9.530	95	5	1.46	1.40	159,383	5.73	12.11	8,731	3.000	66.3	578	212,058
New Jersey	13	25,173	239,909,555	9.421	90	10	1.59	1.42	325,921	3.77	12.88	15,689	2.868	58.6	1,682	390,059
New York	41	411,188	4,035,178,038	9.723	98	2	1.16	1.15	4,799,740	3.83	11.03	248,271	3.468	59.5	22,041	5,610,138
N.&S.Carolina	3	11,138	109,113,500	9.797	79	21	1.64	1.20	118,916	4.73	10,68	6,896	5.310	61.9	....	207,562
N. Dak., Utah & Wyoming	3	2,602	26,520,000	10,192	64	36	1.82	1.11	33,129	7.01	12.73	1,352	5.865	52.0	....	48,947
Ohio	41	299,353	2,935,993,358	9,808	86	14	0.96	0.83	3,901,258	3.11	13.59	205,947	1.852	68.8	90,037	3,159,376
Oregon	4	5,112	38,780,000	7.586	83	17	2.28	1.62	69,819	8.51	9.08	2,399	4.707	52.6	450	94,141
Pennsylvania	22	310,043	2,867,466,490	9.249	99	1	1.03	1.02	163,103	2.63	13.58	190,591	1.868	61.5	13,720	3,381,149
Rhode Island	4	50,669	499,814,400	9,864	73	27	1.18	1.11	646,130	4.91	12.75	33,608	2.650	66.3	13,483	702,593
Tennessee	8	34,511	304,944,820	8,836	84	16	1.49	1.14	393,445	3.34	11.40	22,636	2.886	65.6	9,380	452,905
Texas	11	15,393	144,970,500	9,418	62	38	2.14	1.51	173,304	6.81	11.26	9,461	5.013	61.5	140	302,701
Virginia	9	22,384	203,564,372	9,094	98	2	1.17	1.25	218,546	3.15	9.76	11,025	2.491	49.3	132	251,335
Washington	6	13,928	129,688,100	9,311	94	26	1.97	1.51	117,606	8.64	8.44	8,295	4.138	59.6	....	277,438
W. Virginia	5	17,530	151,416,900	8,637	98	2	0.82	1.28	231,806	2.62	13.22	11,186	1.351	63.8	2,717	125,511
Wisconsin	13	71,197	680,972,900	9.565	63	37	1.09	0.81	1,267,258	2.31	12.70	42,524	3.052	59.7	23,832	815,029
Total	433	2,042,698	19,469,464,957	9.465	87	13	1.19	1.03	24,384,798	3 70	12.55	1,216,279	$2.961	62 6	$284,148	$26,300,394

NOTE.—A further list of totals might be added. For example, the report gives the total value of tar recovered as $902,400; value of sulphate of ammonia made by the works, $10,430; total value of coke made, $3 601,121; total value of bye-products, $4,798,099; and of coal gas sold, $21,502,295. Of the 18,431,201,414 cubic feet of coal gas sold, 86·57 per cent. was for illuminating and 13·43 per cent. for fuel purposes. This seems small; but it is no doubt compiled from reports.

Commenting on the table, our contemporary said: Care seems to have been taken not to include water gas, oil gas, or gas made from other materials than coal; the oil-gas enricher being excluded, for example, from the column devoted to gas, made per ton of coal. It will be seen that there are 433 works in which coal gas is treated separately. There was a total of about 990 gas companies in the United States in 1898, according to the statistics in Brown's "Directory of American Gas Companies for 1898," and the distinctly coal-gas works are thus apparently nearly half the total. The report states that of the total 50,385,468,668 cubic feet of gas made, 38·64 per cent. was coal gas, 60·37 per cent. water gas, and 0·99 per cent. oil, resin, or wood gas. In 1894, there was a compilation made of the approximate annual output of gas companies in America; arriving at a total of 52,642 million cubic feet, 59·17 per cent. of which was water gas, and 40·83 per cent. coal gas. In the first place, the production has increased enormously since that time, and is now probably more nearly 80,000 than 50,000 millions. Again, the proportion of water gas has been increasing instead of diminishing, so that at present probably three-fourths of the gas made is water gas. The total average price is given as $1·16 per 1000 cubic feet. As the average of all gross prices is about $1·60, due weight being given to the quantity sold, it would appear that the average discounts were over one-fourth the gross price. The author of the report (Mr. W. B. Phillips) gives the average unaccounted-for coal gas as 5·33 per cent. of the total make; so that the leakage was somewhat less than this. In the table it will be interesting to note the influence of various qualities of coal upon yield and residuals. It is difficult to see why Massachusetts should obtain 14·3 gallons of tar per ton of coal while its neighbour, Connecticut, recovers but 9·39 gallons. The yield from some of the "lean" coals is also notable. These, however, are simply details and will no doubt be revised as the compilers get more expert in interpreting and verifying reports.

THE PRODUCTION OF AMMONIACAL LIQUOR AND SULPHATE OF AMMONIA IN THE UNITED STATES.

In a recent number of "Progressive Age," Mr. W. B. Phillips gave some statistics on the above subject, extracted from the official report of the Division of Mineral Resources of the United States Geological Survey, contained in the last annual report (for 1898-9). The following extracts from his article are interesting in connection with the table of coal-gas statistics given elsewhere.

Sixty returns were made as to the amount of ammonia liquor produced at gas-works in 1898; and, in addition, there were six reports from establishments not giving a separate account of the liquor, but stating the amount of aqua ammonia produced. The total quantity of ammonia liquor reported by the 70 establishments was 25,749,792 gallons, produced from 1,358,094 tons of coal, and valued at $284,148. The strength of

the liquor was stated in various ways—some giving it in ounces, some in degrees Twaddel, and a very few in the percentage of anhydrous ammonia. It would appear advisable to adopt a uniform system for expressing the strength of ammoniacal liquor based on a more accurate principle than the old ounce system or the Twaddel system, and certainly the percentage system is much to be preferred. What percentage of ammonia does the gas liquor contain? This question once answered, there is nothing more to be desired, except the guarantee that the method adopted for the estimation of the ammonia shall be such as to commend itself both to buyer and seller. Throughout the trade generally, gas liquor containing 1 per cent. of ammonia is considered as 4-oz. liquor, and this is well understood. It would be advisable, therefore, to discard all other ways of grading gas liquor in favour of the percentage system, for this is the basis on which the liquor is bought.

The total amount of gas liquor produced in 1898, as mentioned above, was 25,749,792 gallons, for the production of which 1,358,094 tons of coal were required. The output of liquor per ton of coal, as well as the price per gallon, depends upon the strength, so it is obvious that no general average can be obtained. The production per ton of coal carbonized varies within very wide limits—*i.e.*, from 0·2 gallon to 137·8 gallons—while the price per gallon varies from 0·3 c. to 18 c. Of liquor giving from 1 to 5 oz. of ammonia per gallon, there were made 23,767,678 gallons, or 92·4 per cent. of the total; from 5 to 10 oz., 1,027,102 gallons, or 4 per cent.; from 10 to 15 oz., 80,100 gallons, or 0·3 per cent.; from 15 to 20 oz., 214,850 gallons, or 0·8 per cent.; from 20 to 25 oz., 575,910 gallons, or 2·2 per cent.; from 25 to 30 oz., 45,752 gallons, or 0·3 per cent. The amount of liquor containing less than 10 oz. of ammonia, or 38·8 oz. of sulphate of ammonia, per gallon is 96·4 per cent. of the entire output. It is not customary in America to concentrate the liquor sold to the distilling companies above what is known as "30-oz. liquor," or 7·5 per cent. of ammonia. The amount of liquor concentrated above this strength is comparatively insignificant, although a little is carried to "80-oz.," corresponding to 20 per cent. of ammonia, or 27·83 oz. of ammonia (= 107·98 oz. of sulphate of ammonia) per gallon.

It is thought that the total production of sulphate of ammonia from gas liquor did not exceed 3000 tons in 1898. If all the liquor reported had been worked up into sulphate, the production would have been 11,974 tons. The difference between these figures—8974 tons—represents the sulphate that could have been made, but was not made because the ammonia distilled from the liquor was used in some other form. In other words, the 8974 tons represent 2316 tons of anhydrous ammonia obtained from gas liquor, but not made into sulphate. Besides sulphate, there are other valuable uses to which ammonia is put—*i.e.*, in ice factories, chemical works, &c.; and there is a large and increasing demand for it.

ELECTRIC LIGHTING NOTES.

The Stourbridge District Council have resolved to oppose the application of the Midland Electric Corporation for Power Distribution, Limited, for authority to distribute electricity in the district.

The recent failures of the Metropolitan Electric Supply Company to furnish their consumers with current are to be brought under the official notice of the President of the Board of Trade, who has consented to receive a deputation on the subject on the 17th inst.

At Leigh, the electric light supply was switched on for the first time last Tuesday. The installation has cost above £10,000. At present only the compulsory area is supplied; but extensions are already projected. The charges are 7d. per unit for the first hour, and 2½d. per unit after. The question of electric traction, it is said, is now being considered.

The foundation-stone of the power station in connection with the electrical undertaking of the Wigan Corporation was laid last Thursday by the Mayor (Mr. J. T. Gee). It is anticipated that the new venture will involve an expenditure of £85,000 for the purpose of electric lighting and £40,000 on two lines of tramways, to be further developed for the whole of the system; making a total outlay of between £300,000 and £400,000. The Mayor, in declaring the stone laid, said he expected that within a very short time they would not only be able to supply the borough itself, but also the out-townships. They had to prove to these townships that the Corporation could supply electricity with greater facility and as cheaply as they could produce it themselves.

In reviewing the past year's work of the District Council of Larne, the Chairman (Mr. D. M'Quillan) remarked that Larne claimed to be the second town in Ireland to adopt electric lighting; but, unfortunately, it could not lay claim to being one of the best or cheapest lit towns. However, the Council had appointed a Committee, who were at present considering the entire question of the public lighting of the district whether by gas, by electricity, or by both; and he hoped they might soon be in the position of other public bodies who were able not only to light the streets without cost to the ratepayers, but at the same time to pay over a nice surplus to the relief of the rates. On presentation of the account of the Electric Light Company for the half-season's lighting, amounting to £195 5s., considerable discussion took place; it being eventually decided to issue an order for the amount, and claim a recoupment in respect of unsatisfactory lighting.

The formal transfer of the undertaking of the Birmingham Electric Supply Company to the Corporation took place yesterday week, when Mr. E. V. Hiley (Deputy Town Clerk) and Mr. T. H. Clare (City Treasurer) paid over to Mr. J. C. Vaudrey (Managing Director) and Mr. R. A. Pinsent (Solicitor to the Company) a cheque for £420,000, and received in return the deed of conveyance of the assets of the Company. It is now about two years since the agreement to purchase was arrived at; but it was arranged that the Company should continue to carry on the business, receiving a profit of 6 per cent. for 1898, but handing over the profit for 1899. The accounts, which will be presented by the Electric Light Committee at an early date, will, it is understood, show that, even at the high price at which it has been purchased, the concern comes into the hands of the Corporation as a paying enterprise. The history of the Company practically covers a period of ten years. It was registered in December, 1889, with a capital of £200,000 in £5 shares, all of which has been called up. The Company started supplying current in April, 1891, and at the end of December carried forward a credit balance of £361. In 1892 a dividend of 3½ per cent. was paid; while in the succeeding years the dividends were: 1893-5 4 per cent., 1896 4½ per cent., 1897 5 per cent., 1898 6 per cent. The price at which the Company consented to sell to the Corporation was calculated on the basis of £10 10s. per share. The Corporation take over the staff of the Company; and Mr. Vaudrey becomes Electrical Engineer to the city.

Another of the series of explosions caused by faults in the electric cables of the city occurred near the Manchester Royal Exchange shortly before two o'clock last Friday afternoon. A terrific report startled the neighbourhood, and the stone flags in front of the Exchange were lifted for a distance of 20 yards. At the same time flames shot from a large opening near Bank Street. The officials of the Corporation Electricity Department were promptly on the scene. There were crowds of people on 'Change at the time, and thousands more quickly assembled in the streets. When the excitement had somewhat subsided, it was found that no one had been seriously hurt. This was a most miraculous circumstance, as a great many people were near the spot at the time of the explosion. The Fire Brigade were summoned, and they soon put out the fire. Mr. C. H. Wordingham, the City Electrical Engineer, who visited the scene shortly after the accident, explained that it was due to the fact that the old-fashioned rubber cables were liable, under certain conditions, to portions of the insulating material melting from excessive heat, and generating an explosive mixture. For some time past, his department had been busy in the removal of this class of cable from the streets; but of late there had been a slackening of the work from a desire not to interfere too much with the Christmastide business in the locality. The cable which was the cause of the explosion was a portion of a comparatively small section now waiting to be replaced, and it would be entirely removed before long. The accident caused a temporary resort to gas; but the supply of electricity throughout the city was not affected to any considerable extent.

From a report prepared by Mr. J. H. Rider, the Borough Electrical Engineer, it appears that it is already necessary to enlarge the Plymouth municipal electricity works in order to meet the demand for current. In addition to supplying the electric tramways and the arc lamps for street lighting, the machinery can serve 7500 8-candle power lamps at one time. There is, however, a demand for more than 12,200 lamps; and in order to provide for present and future requirements, Mr. Rider recommends that additional plant be provided to raise the capacity of the works to 25,000 lamps, in addition to the arc lighting and the tramways. He also proposes an extension of the cables in certain streets where they do not exist. In all, it is proposed that for private lighting purposes additional borrowing powers to the extent of £48,000 shall be obtained. This sum includes £10,720 which was spent of the sum originally borrowed for the construction of the works, and £12,500 for the extension of the buildings, which will then be adapted for further additions to the plant. A very modest estimate is formed by Mr. Rider of the profit which is to result from this outlay. The extra lamps should, he says, bring in a revenue of about £5000 per annum. But assuming that the Corporation can borrow the money at 2¾ per cent.—which is by no means certain now—and that 25 years is allowed for its repayment, the interest and sinking fund charges will come to £2750 per annum, while the additional wor ks charges will be about £1500 per annum. The net profit, therefore, will be only £740, or 1½ per cent. on the outlay. Whether the works charges—which Mr. Rider described as "coal, water, wages, &c."—include a renewal or depreciation fund, is not clear. If not, the realization of even so small a profit as £740 may be difficult. On the other hand, if the business continues to grow, future extensions can be carried out at less cost, because the buildings now to be erected will accommodate more machinery than is to be immediately installed.

The correspondence on the subject of the dangers of wood casing for electric light cables, recently initiated by Mr. Montague Crackanthorpe in "The Times," has been continued. On Monday last week, a letter appeared from Mr. Musgrave Heaphy, whose name is well known in connection with the formulation of the Fire Insurance Companies' rules in regard to electric lighting, which, it appears, have now reached their 29th edition. He said that "so safe are electrical installations when placed up in accordance with the well-known fire rules, that one of the greatest English Fire Offices, with many thousands of electrical installations insured with it, has never had to pay a shilling for loss with regard to any installation (so far as it can trace) when placed up in accordance with its rules." The first rule runs as follows: "Where practicable, all conductors in a building should be so placed as to be easily accessible, and capable of being thoroughly inspected whenever required. Conductors should not be run out of sight, such as between floors and ceilings, inside roofs, behind skirting boards, wainscoting, &c., if it can be avoided." Mr. Heaphy is an advocate for enclosing conductors in approved fireproof tubes or fireproof casing where they can be adopted; and he has devoted a great deal of attention to the subject. Unfortunately, he says, it makes the work expensive; and to compel all installations to be placed up in this manner, might to a large extent prohibit the use of electric lighting in this country. After all, however, it is not the wood casings that cause the fire, but the work that is inside them. He concluded his letter as follows: "My experience, which has been a very large and long one with regard to electric fire risks, is that no form of illumination is so safe as the electric light, if it is properly placed up; but if the requisite precautions are not taken, then it may be a cause of great danger. What I would earnestly advise anyone to do who has any doubt or fear on the matter, is to have the electrical work supervised by a consulting electrician (of whom there are many very competent men), and instruct him to see that the work is placed up in accordance with the advice of the Fire Office, and that afterwards the installation is not allowed to get out of order, as is often the case. I do not think then that any user of the electric light would have much cause for alarm." Another correspondent—Mr. A. Grove—after alluding to the fear which had been caused by Mr. Crackanthorpe's letter, made the following remarks: "Had your correspondent chosen, he could have had his wires protected by iron or steel pipes, or, if experimentally inclined, by one of the patent substances referred to in his letters. But, whatever is used for the purpose, foresight and good workmanship lie at the root of the matter. In common with all the details of electric lighting, the use of wood casing has been very much abused, and it has been made the medium of much scandalously bad work; but that is no reason why what is so useful a material when intelligently used should be condemned

altogether." Mr. Crackanthorpe replied to these correspondents in a letter which appeared last Wednesday. He said he had read their letters with some amusement, as both writers had unconsciously shown themselves to be of his own opinion. One advocated enclosing the conductors in approved fireproof tubes or casing; and the other said he (Mr. Crackanthorpe) could have had his wires protected by iron or steel pipes. This, he said, was precisely what he wished he had done. With regard to the rules of the Fire Offices, he characterized them as merely "a red herring across the path;" the practical question being: What are the actual requirements insisted upon by the Insurance Companies before granting a policy? He had under his eye a copy of those in use by one of the leading Companies, and it gave no caution as to laying wires between floors and ceilings; while with regard to wood casing it said: "In most instances, the use of wood casing or approved metal piping throughout is advisable, and if there is any risk of injury to the insulation of the conductors it [without specifying which, or hinting any preference between the two] must be used." Mr. Crackanthorpe went on to say that the revised rule quoted by Mr. Heaphy did, it was true, specify that "conductors should not be run out of sight, such as between floors and ceilings, &c., if it can be avoided;" but he suggested that the last five words had better be omitted in the next edition. Avoidance was always possible, and should not be left to the discretion of the electrical contractor. He closed his letter as follows: "It is not a little remarkable that neither Mr. Heaphy nor Mr. Grove makes the smallest allusion to Professor Silvanus Thompson's letter of Dec. 22, in which he declares that "he would not allow an inch of wood casing in his own house." One would have thought that the President of the Institution of Electrical Engineers was a foeman more worthy to be met in the open than an ignorant Q.C. While your correspondents fight under shelter of my fire, they obviously shrink from again drawing his." The subject has brought letters from several other corr.spondents.

THE MINERAL OIL AND PARAFFIN INDUSTRY OF SCOTLAND DURING THE PAST YEAR.

The following article on the above-named subject recently appeared in the "Scotsman."

The mineral oil and paraffin industry is confined to a narrow strip of Scotland, extending from the neighbourhood of Edinburgh westwards as far as Renfrewshire, and governed, of course, by the presence of shale strata in paying seams. The pick of the field is found in the counties of Mid Lothian and West Lothian. Workable plots occur in Fifeshire, Lanarkshire, and Renfrewshire; but these constitute the mere outposts of the main territory. Shale is found in many parts of the country, and at varying depths; but it is only within the bounds thus briefly sketched that the mineral is encountered in a thickness of seam and goodness of quality sufficient to induce the working of it on an industrial scale. Thickness and quality vary considerably even within the same field; and the constituents are never precisely alike in samples taken from different beds. Some give a rich yield of sulphate of ammonia, while they are less productive in oil and solid paraffin; with others it is the reverse. In the process of the distillation of the shale mineral, crude oil and sulphate of ammonia are first produced; afterwards the crude oil is subjected to an elaborate series of mechanical and chemical operations, whereby the manufacturer gets the more refined products and variants in a form suitable for being put on the market. These are burning oil (for lamps and oil stoves); lubricating oil; grease-making and gas-enriching oil; paraffin spirit (known as naphtha on the market), and paraffin scale—the last-named being a solid. The main consumers of paraffin scale are the candle makers of England and Scotland. By them this solid paraffin is further cleansed and refined into the beautiful product paraffin wax, which, though chiefly used for candle making, is also employed in many other ways, and partly as an art material. For the products thus enumerated, the year 1899 was truly a remarkable year. In the review of the industry for the year 1898, there was indicated the promise of better times for this long-time sorely-badgered manufacture. The reality has much more than justified the forecast then presented; for the year 1899 witnessed the advancement in market value of not one or two only of the products, but of the whole of them without exception, and that in no stinted fashion, as the following particulars will show.

As the year opened, sulphate of ammonia fetched fully £10 per ton—a fairly good price, having regard to the low values formerly ruling. It is a very volatile article on the market, changing almost every day, and sometimes several times in one day; being subject to no agreement among the producers, as is the case with some other products. On to the beginning of June the general tendency was to the rise; and to good purpose, too, for at that time it had mounted to £13 per ton—a gain of £3 within a period of six months. This summit was not long kept. But good values still ruled, though on a gradually descending scale; and makers were into September before the article fell below £12. In November, it made a dip down to £10 7s. 6d., but immediately recovered; and as the year was closing in, the figure was over £11. Altogether, a very satisfactory year it has been for sulphate of ammonia from the makers' point of view. But burning oil is still the foremost product of all the refining companies; being by far the bulkiest, and, therefore, the most profit-producing when values are satisfactory, and the most unprofitable when these values fall below the remunerative point, as they have sometimes done. This article is marketed under a mutual agreement between the various producers in Scotland. Each August brings these producers into conference, at which the price of burning oil is fixed for the coming winter season. The thing which governs these annual conferences is not mere inclination or expediency, but simply the condition of the American petroleum market. If it happens to be very low, the Scottish makers must stoop accordingly, or find themselves out of the market altogether. There is no choice. Too often the Scottish price has been thus pressed down to beneath the paying point; and company after company has gone under in consequence. But of late the over abundant American supplies have been decreasing in volume, while the markets of the world have been growing; and the Scottish makers find themselves nothing like so sorely pressed. In August, 1898, the season's price per gallon was fixed at 6d. and 6½d., according to quality. This was not bad; but it might have been better if the course of the American market could have been foreseen. In August, 1899, American stiffness still holding, the Scottish makers found it open to them to ordain a substantial advance of ¾d. per gallon over the fixture of the previous year. This represented a great stride, for the figure of ¾d. a gallon, humble as it looks, means the addition of many thousands of pounds of revenue to the industry as a whole for the working year 1899-1900. Contracts were freely fixed at this advance, and values on the market have been well maintained.

The heavier oils of the manufacture are those suitable for batching and lubricating; and they also are largely ruled, as to the market condition, by the disposition of the American competitors, and the quantity imported by them. For some years Scottish lubricants have been permitted to maintain a fairly respectable grade, and now and again they have been the only item on the list of production which left any profit worth speaking of. When the year began, gravities from 865° to 895° were bringing in from £4 15s. to £6 10s. per ton. They were in brisk demand; and altogether this section was held to be in a healthy condition. But American lubricants continued to creep up, and they have so continued; enabling the Scottish makers to increase their values to such good purpose that the range now is from £6 to £8—representing an advance of 30s. per ton for the higher of the gravities, and quite 25s. for the lowest. A great lift this is for the industry, more particularly as the demand does not seem to have been in any way checked by the advance. Naphtha, as one of the products of shale, is always small of bulk. But it counts for something; and during 1899 it maintained quite a high value. The average for 1898 was 6¾d. to 7¼d. per gallon. But there has been almost a complete doubling of price since then; and 1s. per gallon is now being obtained. This product has no imported rival as in the other cases; and the industrial applications of it (apart from being an illuminant) are increasing every year. But, as regards the past year of advances all along the line, the most notable item, on many accounts, is that of solid paraffin, long sorely kept under by the heavy and cheaply-priced imports from America. There was some little betterment during 1898. But this was not enough for a sufficient margin of profit; and one or two of the works had still to produce at little more than cost price, if not at a positive loss. A further advance was registered just as 1899 began, making the range 1¾d. per pound for hard paraffin scale, up to 2¾d. for semi-refined paraffin wax. It happened to suit the book of the American petroleum refiners to get as much for their scale and wax as they could; and accordingly, under informal agreement with the Scottish makers, there have been several further rises since—the last and most important being in November, after Mr. Bedford, of the American Standard Oil Trust, had visited Glasgow, and had friendly conference with the chiefs of the Scottish industry. The range is now the handsome one of 2¾d. to 3⅛d. per pound, according to the degree of refinement; and granting continuance, of which there is some reasonable prospect, there is in it salvation for even the most badly battered of the surviving companies. These solid paraffins comprise a large annual production, and there is much money in it, when the market rates are remunerative, as for years, till now, they have not been.

The above, on the face of it, is a very favourable—almost a glowing—account of the present circumstances of a great Scottish industry, which only the other day was on the brink of ruin. But there are drawbacks, of which account also must be taken, before a strictly proportioned view of the situation is obtainable. Costs of production have become dearer in every item of them, and very dear in the chief items. Large quantities of fuel are needed, and fuel has become very costly. Labour charges are all enhanced; and chemicals, of which there is a large consumption in the refineries, which likewise mounted, are still mounting. On companies that would thrive in the future, it is imperative to have their retort plant of the newest and most economical types; and the renewal of retorts runs into large outlays of capital. Some of the companies have managed, or are managing, to effect this; but others, more sorely burdened, are not sure about the necessary ways and means, and lag behind at a great disadvantage. What the precise effect of the higher market values is, will not be known till the annual balancing period in the spring of 1900. The balancing in the spring of 1899 proved only too surely that the time of struggle had not by that time ended. It has to be borne in mind, however, that, owing to the "forward" contract system so largely obtaining in the industry, it is possible for the benefits of a rise in market value not to be felt by makers until nearly a full year thereafter.

The Broxburn Company, which paid 7½ per cent. in 1898, and was the only concern paying anything at all that spring, bettered its shareholders by 1 per cent. in 1899; the rate of division being 8½ per cent., after fully providing for other burdens. The Oakbank Company resumed paying dividend with 5 per cent., which was a good mark to make. The Pumpherston Company did better than over the foregoing year; but had still nothing for the ordinary shareholders. The Holmes Company again showed a loss; but it was a very small one. The Linlithgow Company came out with a continued leakage of capital; but nevertheless the directorate showed itself in good hope for the future, providing the market improvement lasted. Young's Company was much the worst of the lot, with the serious deficiency of over £17,000, and at first carrying dismay into the ranks of the shareholders. Here, improved retorts are expected to do much for retrieval; and that confidence is not entirely killed has been shown by the advance in the value of the shares since the latest of the product rises in the market. The Clippens Oil Company have their works still closed, waiting finality in their action with the Edinburgh and District Water Trustees; and Directors and shareholders are living and waiting in the one hope of being awarded damages commensurate with the losses sustained. The Hermand Company—shut down for years owing to low market values—has now been reconstructed, and the works have been reopened. The Caledonian Company (of Tarbrax, Lanarkshire), which had been forced into liquidation by the pressure of bad times, though wisely kept on a going footing by the creditors, has also been reconstructed and rehabilitated, and now looks forward to being able to show a good balance in 1900. The Dalmeny Company—of small capital, and confined to the production of crude oil and ammonia only—balance at the end of October; and the announcement of the results was looked for daily as the year closed in. At the end of 1898, they announced a 5 per cent. dividend, and now it is likely to do better. In the old good times, the Dalmeny Company returned to the shareholders as high as 25 per cent. on one year's working.

As might have been expected, the remarkable year 1899 did not run its course without trouble to the companies of the wages agitation description. Miners, retort men, and others, were on the quest for higher rates, with a bettering market to back them; and masters generally made substantial concessions—only on the saving understanding, however, that they were not to be attacked again in this way till after the 1900 spring balancing. It is felt that the long-suffering shareholder should at last have some little return for his investment.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

When I wrote what appeared in the last number of the "JOURNAL" about the Corporation of Glasgow ascertaining the facts relative to the operation of Conciliation Boards elsewhere, I scarcely expected that the facts would begin to, so to speak, prove themselves. Yet so it is. Yesterday there appeared in the columns of the "Glasgow Herald," a letter by Mr. A. R. Cawley, Manager of the Llanelly Gaslight Company, in which he says:

I desire, by means of your paper, to take strong exception to several of his [Mr. Burgess's] remarks. First, that a London Executive is a steadying force; second, that it sits as a Court of Appeal; third, that before a district can enter upon a strike, it has to satisfy the London Executive that there is no alternative course open if justice is to be done. If the latter statement is correct, then I ask why the stokers at Llanelly Gas-Works were allowed upon two occasions (May and September, 1898) to cease work without notice. Both times the works were stopped before the questions in dispute were 24 hours old, and the town in darkness. Upon the latter occasion, Mr. Will Thorne, the General Secretary of the Gas Workers' Union, stated at an interview with the Directors of the Llanelly Gaslight Company that the men had been out on strike 24 hours before he was aware that there was any dispute. So "what price" the hird statement made by Mr. Burgess? The Directors upon both occasions offered to refer to arbitration; but it was refused in the latter case by the General Secretary of the Union himself, so that really the whole of Mr. Burgess's statements go overboard. I may here state that the questions that have been in dispute at Llanelly were very simple. The Company claimed as employers to use their own discretion in cases of promotion. The men claimed to say—and were supported by the Union—which men were to be promoted to any vacancy that might occur, they proceeding according to the rotation in which the men entered the service of the Company—qualifications not being taken into account. Instead of the London Executive being a "steadying force" in favour of conciliation, it appears to me to be more that of "domination." We have here at the Llanelly Gas-Works men employed who have not been engaged by the Company; but because they have been found employment in previous winters, the men who are members of the Gas Workers' Union insist upon them being employed this and future winters. The same state of affairs exists with regard to a number of men now working here who have on different occasions been discharged for various reasons; the Union, by their support of the men, claiming to say whether the employees or the management were to have the right of judging when a man is doing his work satisfactorily or not. I think that your readers will agree with me that the foregoing actual state of affairs places a different light upon the objects of the Union to those advanced by Mr. Burgess.

In another of your issues, he names a number of places where the Union is recognized, of which one is Manchester. I think that his connection with the Union cannot date very far back, or else he would remember that exactly 11 years ago practically the same state of affairs existed there as now exists at Glasgow; but the Corporation of Manchester (the Salford Corporation also), in the interests of the gas consumers and the ratepayers, gave battle to the Union—the fight ending disastrously for the men, many of whom never again entered a gas-works. In regard to the signing of contract notes for a period to cover the winter season, I am strongly of opinion that it is the proper course to adopt at a gas-works—especially so when is taken into consideration the number of people who are dependent on the regular working of a gas-works. In all works there are a number of vultures in the form of idle, dissolute men, whose only qualification is a noisy tongue, and who only retain their situations by means of the terrorism which they impress upon other men, who, for fear of molestation, are forced to follow their lead and instructions, much against their own will. The signing of the contract notes is a means of preventing the terrorism to a great extent, and thus allows a workman to discharge his duties to his employers as he agreed to do at his engagement. Glasgow is not the only town where contracts of labour are signed. There are many, as inquiry will prove. During the past twelve months, workmen who are members of the Gas Workers' Union have upon three occasions, at two different works in this town (a tinplate works and a copper smelting works), ceased work without giving notice—in each case practically throwing down their tools. The public not being dependent upon either of the works, the proprietors were able to shut up the works for an indefinite period; and the result on the three occasions was that the strikes fizzled out, the men returning to work upon the same conditions as before.

I think that the Corporation of Glasgow, and your readers in general, will from the above, without much difficulty, be able to judge what will be the state of affairs in the Gas Department if the proposed Conciliation Board ever becomes an actual fact.

If a few more gentlemen who have had experience of what conciliation means would follow Mr. Cawley's example, and give their colleagues the benefit of their views, it might be possible to educate the Glasgow Corporation to a knowledge of the right in this matter, before they are called upon to consider the Conciliation Board proposals. Mr. Cawley's arguments are the more valuable in that they do not rest upon theory, but are based upon actual observation and experience.

To-day Mr. Burgess writes to the "Glasgow Herald" to say that he cannot answer Mr. Cawley's letter, as it contains statements of fact of which he has no knowledge; but that he has sent the letter on to the Central Office of the Union, and he asks judgment to be suspended until a reply is received. He then adds that he was only temporarily acting as District Secretary at Glasgow, during the illness of the Permanent Secretary, and that his duties terminated on Dec. 16. Verily, being only a temporary hand, Mr. Burgess had about as cool an assurance as has ever been manifested in his action with reference to the Glasgow Corporation's attitude towards their gas workers.

The proposal of a Committee, who have been considering the subject for a year and a half, was accepted by the Corporation of Glasgow this week, to the effect that the Corporation should form an insurance fund for the restoration of property belonging to them which may be destroyed by fire. From notes supplied by Mr. Nicol, the City Chamberlain, it

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 77.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p. c.	21—22	..	4 15 5
100,000	10	,,	7½	Do. 7 p. c.	14½—15½	..	4 16 9
800,000	100	Jan. 2	5	Australian 5 p. c. Deb.	100—102*	+½	4 18 0
200,000	5	Nov. 15	6	Bombay, Ltd.	5⅞—6⅛	..	4 8 11
40,000	5	,,	6	Do. New, £4 paid	4—4½	..	5 6 8
880,000	Stk.	Aug. 16	12	Brentford Consolidated	273—278	..	4 6 4
270,000	,,	,,	9	Do. New	210—215	..	4 3 9
50,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
159,375	,,	Dec. 14	4	Do. 4 p. c. Deb.	124—128	..	3 2 6
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig.	250—260	..	4 8 6
226,320	,,	,,	8½	Do. A. Ord. Stk.	183—188	..	4 10 5
973,500	Stk.	Aug. 16	5	Bristol, 5 p. c. max.	125—130	..	3 16 11
420,000	20	Sept. 29	10	British	43¾—44½	..	4 9 10
50,000	10	Aug. 31	12	Bromley, Ord. 10 p. c.	25—27	..	4 8 11
75,000	10	,,	9	Do. 7 p. c.	19—21	..	4 5 8
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	9—9½	+½	6 6 4
220,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb.	98—100*	..	4 0 0
150,000	20	July 13	8½	Cagliari, Ltd.	28—29	..	5 13 10
100,000	10	Sept. 29	8	Cape Town & Dis., Ltd.	13¾—14½	..	5 10 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	56—58	..	5 3 5
550,000	Stk.	Oct. 13	13½	Commercial Old Stock	305—310	..	4 7 1
200,750	,,	,,	10½	Do. New do.	240—245	..	4 5 9
200,750	,,	Dec. 14	4½	Do. 4½ p. c. Deb.	140—145	..	3 2 1
800,000	Stk.	Dec. 14	9	Continental Union, Ltd.	177—181	..	4 19 5
200,000	,,	,,	7	Do. 7 p. c. Pref.	178—183	..	3 16 6
51,600	Stk.	Aug. 31	14	Croydon A 10 p. c.	335—340	..	4 2 4
168,400	,,	,,	11	Do. B 7 p. c.	265—270	..	4 1 5
555,000	Stk.	Aug. 16	5½	Crystal Palace Ord. 5 p. c.	130—135	..	3 17 9
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
486,090	10	July 28	11	European, Ltd.	21—22	..	5 0 0
854,060	10	,,	11	Do. £7 10s. paid	15½—16½	..	5 0 0
14,993,075	Stk.	Aug. 16	4⅛	Gas-light and Coke	4 p. c. Ord.	..	4 12 5
2,600,000	,,	,,	3½		3½ p. c. max.	..	3 10 8
3,799,735	,,	,,	4		4 p. c. Con. Pref.	..	3 7 5
2,993,975	,,	Dec. 14	3		3 p. c. Con. Deb.	..	3 1 3
70,000	10	Nov. 15	8	Hongkong & China, Ltd.	13½—14½	..	4 12 2
3,800,000	Stk.	Nov. 15	10	Imperial Continental	212—217	..	3 7 4
473,600	Stk.	Aug. 16	3½	Do. 3½ p. c. Deb. Red.	101—104	..	3 7 4
75,000	5	Dec. 14	6	Malta & Medn., Ltd.	5—5½	..	5 9 1
660,000	100	Oct. 2	5	Met. of	5 p. c. Deb.	..	4 7 9
250,000	100	,,	4½	Melbourne	4½ p. c. Deb.	..	4 2 7
641,920	20	Nov. 15	3	Monte Video, Ltd.	11—12	..	5 0 0
617,946	Stk.	Aug. 31	9½	Newc'tle & Gatesh'd Con.	290—295	..	4 2 3
264,855	Stk.	Dec. 29	3½	Do. 3½ p. c. Deb.	104—107*	..	3 5 5
60,000	5	Sept. 29	7	Ottoman, Ltd.	5½—5⅝	..	6 1 9
					*Ex div.		
150,000	5	Nov. 30	8	Oriental, Ltd.	7—7½	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	6½—6⅝	..	5 6 8
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1⅜	..	4 11 5
500,000	100	Dec. 1	6	People's Gas of Chicago	2nd Mtg. Bonds	102—106	..	5 13 2
851,070	10	Oct. 13	7	River Plate Ord.		10⅜—11¼	+¼	6 4 5
250,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb.		98—100*	..	4 0 0
250,000	10	Sept. 15	10	San Paulo, Ltd.		12—13	..	7 13 10
135,000	Stk.	Sept. 15	10	Sheffield A.		249—251	+2	3 19 8
209,053	,,	,,	10	Do. B.		249—251	+2	3 19 8
447,427	,,	,,	10	Do. C.		249—251	+2	3 19 8
5,600,000	Stk.	Aug. 16	5⅜	South Metrop., 4 p. c. Cri.		133—136	..	3 18 5
1,520,000	,,	July 13	3	Do. 3 p. c. Deb.		101—103	..	2 18 3
120,000	Stk.	Aug. 31	6	Tottenham and	A. 5 p.c. B. 3½ p.c.	141—143	..	4 3 11
250,520	,,	,,	4½			102—104	..	4 6 6
55,100	,,	Dec. 14	4	Edmonton	4 p. c. Deb.	113—117	..	3 8 5
182,380	10	June 15	5	Tuscan, Ltd.		9—10	..	5 0 0
149,900	10	Jan. 2	5	Do. 5 p. c. Deb. Red.		101—104*	+6	4 16 2
				WATER COMPANIES.				
780,399	Stk.	Dec. 29	11	Chelsea, Ord.		305—310*	..	3 11 0
150,000	,,	,,	5	Do. 5 p. c. Pref.		157—162*	..	3 1 9
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75		145—150*	+5	3 0 0
175,785	,,	Sept. 29	4½	Do. 4½ p. c. Deb.		148—153	..	2 18 10
1,720,560	Stk.	Oct. 13	7	East London, Ord.		200—205	..	3 8 4
654,740	,,	Dec. 29	4½	Do. 4½ p. c. Deb.		145—150*	..	3 0 0
390,000	,,	,,	3	Do. 3 p. c. Deb.		98—100*	..	3 0 0
700,000	50	Dec. 14	7½	Grand Junction	10 p. c. max.	107—109	..	3 8 10
310,000	Stk.	Sept. 29	4		4 p. c. Deb.	131—136	..	2 18 10
708,000	Stk.	Aug. 16	14	Kent		348—353	..	3 19 4
160,000	,,	,,	7	Do. New, 7 p. c. max.		200—210	..	3 6 8
1,043,800	100	Dec. 29	10½	Lambeth, 10 p. c. max.		292—297*	+2	3 10 8
406,200	100	,,	8	Do. 7½ p. c. max.		215—220*	..	3 12 9
350,000	Stk.	Sept. 29	4	Do. 4 p. c. Deb.		125—128	..	2 18 0
500,000	100	Aug. 16	13½	New River, New Shares		428—433	..	3 2 4
1,000,000	Stk.	July 28	4	Do. 4 p. c. Deb.		133—138	..	2 18 0
902,300	Stk.	Dec. 14	7½	South-wark and	Ord. 7½ p. c. max. 5 p. c. Pref.	202—207	−1	3 12 6
126,500	100	,,	7½			190—195	..	3 16 11
489,200	Stk.	,,	5			160—165	..	3 0 7
1,019,585	,,	Oct. 13	4	Vauxhall	4 p. c. A Deb.	131—136	..	2 18 10
1,155,066	Stk.	Dec. 14	10	West Middlesex		290—295	..	3 7 9
200,000	,,	,,	4½	Do. 4½ p. c. Deb.		147—152	..	2 19 3
200,000	,,	Sept. 15	3	Do. 3 p. c. Deb.		100—102	..	2 18 10

appeared that the total net premiums paid in the last twelve years was £20,868; and the fire losses made good by the Companies in the same period was £7261. The average premium paid was 3s. 6¼d. per cent.; and the average of fire losses sustained, exclusive of fire-brigade charges, was 1s. 2¾d. per cent. The Committee recommended that a Committee should be appointed to manage and control the proposed Fire Insurance Department; that a fire fund should be established, into which all premiums received from departments for the property covered should be paid, and out of which all expenses incurred would be met; and that a reserve fund should be established to the amount of £30,000, contributed by the several departments of the Corporation. There was a good deal of criticism of the proposals; but, although they were far from being approved by many, no one moved disapproval of the Committee's recommendations, and so the Council unanimously approved of the scheme, and sent it back to the Committee to consider various suggestions which were made. The subject is one which, I should say, a Corporation ought to approach with caution. It was remarked by the advocates of the scheme that by it the expenses of management, which form a very large proportion of the Insurance Companies' outlay, would be saved. I very much doubt that. Once get the scheme established, and a fire or two occur, the heads of departments would begin to press for more efficient fire-prevention and fire-extinguishing arrangements. These would be provided; and the upkeep of them would require to be set off against the present annual charge for fire premiums. It is a scheme which, once started, can scarcely be gone back upon. Again, why stop short at property actually in the possession and occupation of the Corporation? In the matter of preservation from fire, the whole of the property within the city is in the hands of the Corporation, who, at great cost, maintain an establishment for attending to it. A few years ago the Corporation became bankers, by accepting deposits for fixed periods, known as loans. Why should they not extend their financial policy by becoming insurers of property against destruction by fire? It may be said that the scheme is too gigantic for the Corporation to work; but that argument is one which has no bottom. The saving in management expenses would be as great in the case of private as of Corporation property; and an insurance scheme would thus be a profitable investment. But, further, a colossal scheme is just what an ambitious town councillor likes, because it leads to office—and a title. Apart from these general considerations, however, there must be taken into account the particular questions of how such an insurance scheme would affect the various departments. A general Committee, such as is here foreshadowed, is apt to be rough-shod, and to have little compunction for the feelings of individual Committees. Say that a particular department were to obtain a majority upon the Insurance Committee, or a combination were to be formed against a certain department, would not the working results of some of the departments be thereby affected? And would there not be temptation to attempt some such courses? A Committee appointed to attend to a particular department might find part of their work taken out of their hands by the general Committee, and be thereby prevented from doing their work as they desired. In the matter, say, of levying the rate of charge for the insurance fund, were a rate proportionate to value to be adopted, how would the Water Committee fare? Nearly the whole of their property is impervious to fire; yet the Water Committee are wealthy, and it is easy to reach the argument that they could well afford to assist departments in which there was imminent risk of fire. How about the Gas Committee? Portions of the works under their charge are highly dangerous in the matter of explosions, which would be classed as fires; and other portions are not. Would the works be rated all alike? Most probably not at first, because it is to be presumed that the scheme, to start with, would be framed somewhat upon the lines of existing insurances. But should a fire occur in another department, and money be wanted, who can say what the general Committee might resolve upon in order to raise money? If the scheme be gone on with, the adjustment of the premium charges upon the various departments, so that they shall each bear the burden of its fire losses, and not throw it upon other departments, is almost a necessity. This is the initial difficulty to be faced. But over and above all, is it not open to remark that it is possible to over-municipalize it? An Admirable Crichton cannot always be at the head of municipal business; and if an Admirable Muddle should arise—a by no means infrequent official in the service of corporations—profits on paper would be converted into losses in reality. The figures submitted showed that in twelve years the Corporation of Glasgow paid in fire insurance premiums £13,000 more than they received in compensation for fires. Little more than £1000 a year loss. How much of the £1000, under the most favourable circumstances, would remain, after paying for a staff of clerks to manage, and maintaining a more efficient fire establishment? And in the event of the most unfavourable circumstances arising—say, a £100,000 fire—what would the loss be?

In supplement of what I wrote last week regarding the outcry about the scarcity of coal, I may state that I have information that in Fifeshire the pit mouths are congested with waggons filled with coal. It is said by the owners that the railway companies cannot carry it away. The real reason is that they have not orders for the coal. If the railway companies cannot carry coal, neither can they carry other goods; and yet there is no complaint that anything else, whether passengers or merchandise, is being delayed for want of engine power or of carriages or waggons. Further, if there should be such deficiency in this country, how could it extend to the Continent? Yet it is reported that the state of matters on the Continent amounts almost to a coal famine. I hold to my opinion that the coal broker is making a fortune, without any reason except that he knows how to rig the market.

The manufacture of carbide of calcium has developed a new danger, which is, as yet, shrouded in mystery. On the morning of Saturday last, work was started in the manufacture of the material in the works of the Aluminium Company at Foyers, Inverness. This seems to be done by charging a kiln with coke, lime, &c., and then turning upon the material a powerful electric current from an armature hanging over it. This armature was examined on Saturday morning, and was found to be in good order. Yet, in a very short time, the end of it suddenly dropped off, and fell among the molten material below. The weight was about 15 cwt. Its effect was to burst open the furnance doors, and to

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force out the incandescent contents of the kiln upon the floor of the works. Nine workmen were burned—chiefly by the heat of the air, not by contact with the "lava." Two of them were seriously injured; and one has since died. What so suddenly caused the end of the armature to fall off, has not yet been ascertained.

At an early hour on the morning of Saturday last, two sisters were found in their home at No. 161, Kent Road, Glasgow, in a state of illness, and unable to say what was the matter with them. The neighbour who made the discovery found that gas was escaping near their bed. A doctor certified that the women were suffering from gas poisoning. They fortunately recovered. As in many similar cases which have happened in Glasgow, gas was not used in the house.

Hitherto there have been but few penny-in-the-slot gas-meters fixed in the Glasgow area of distribution; but there is now some prospect of the condition of things being altered, for at a recent meeting of the Sub-Committee on Finance of the Corporation there was received a request for these meters to be placed in the houses of such of the properties belonging to the Glasgow Workmen's Dwellings Company as they may require. It was remitted to Bailie Fife (Chairman) and certain members to meet, at their request, representatives of the Company.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 6.

Sulphate of Ammonia.—The market opened very quietly; and during the week considerable sales have been made at a decline on last week's prices. Near the close, however, buying in London having been reported for prompt and forward delivery at £11 per ton, Beckton terms, there has been a recovery, and the quotations have become £11 to £11 2s. 6d. per ton, f.o.b. at the ports, ordinary terms. The London quotation has also been advanced to £11 5s. per ton, Beckton terms, delivery up to March.

Nitrate of Soda is steady on spot, at 8s. per cwt. for fine quality.

LONDON, *Jan.* 6.

Tar Products.—The feature of the week is the marked improvement of carbolic acid, which is realizing a better price than it has seen for some years. The mode of carbonizing now generally adopted produces a tar which contains but a small percentage of carbolic acid as compared with former years; and although the quantity of tar dealt with is larger, it is doubtful whether there is any increase in the production of carbolic acid. The rock ahead of this article, however, is that it may be declared contraband, in which case its higher value would not be maintained. Benzols are very weak and lower. There is a fair demand for toluol, while both solvent and heavy naphtha are firm. Crude naphtha is weaker. Creosote is decidedly steadier, and a large business is reported at the price quoted below. Pitch continues active, with important shipments, though dearer freights are interfering seriously with implementing contracts. Anthracene shows no change. Few makers, however, will accept the market quotation for this article.

The average values during the week are: Tar, 16s. 6d. to 25s. 6d. Pitch, east coast, 34s.; west coast, 31s. 6d. Benzol, 90's, 7½d.; 50's, 10¼d. Toluol, 90 per cent., 1s. 3d.; pure, 2s. Solvent naphtha, 1s. 4d. Crude, 30 per cent., naphtha, 4½d. Heavy naphtha, 1s. 3d. Creosote, 3¼d. Heavy oils, 3½d. to 4d. Carbolic acid, 53's, 2s. 8d.; 60's, 3s. Crude naphthalene, 52s 6d. Anthracene, nominal, "A," 4d.; "B," 2½d.

Sulphate of Ammonia.—This article has been somewhat lifeless during the past two weeks possibly owing to the holidays. There is now a little better tone noticeable; and although dealers are quoting lower prices, makers will not accept less than an average value of £11, less 3½ per cent. at all ports, while for forward delivery £11 7s. 6d. is quoted.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Business in the coal trade of this district is only slowly getting back into its normal condition, owing to the holidays; and during the past week there have been many complaints at the collieries that the men have turned up but very indifferently. The result has been that the output has been very much restricted; and the difficulty already experienced in meeting the requirements of customers—especially in all descriptions of fuel for manufacturing purposes—has been proportionately increased. At many collieries, the position brought about has been really serious, as both they and their customers have been put to the greatest inconvenience in obtaining even the barest supplies to keep works going. The statements, however, which have been so prevalent in the daily Press, as to a famine in coal, are altogether exaggerated; the position being one of delays in transit over the railways, rather than absolute scarcity of supplies. It is exceptional where any material stoppage of operations at works has been brought about by the impossibility of obtaining fuel of some sort or another to keep them going. The real state of affairs is perhaps more accurately represented by the fact that there has been no official upward move in prices with the commencement of the year, notwithstanding that a general advance was very strongly urged in many quarters. The feeling among leading collieries, however, is that it would be unwise, under temporary pressure, to put up prices, which would misrepresent the actual situation to the minds of the miners, and probably jeopardize the amicable arrangements now in hand for a continuance of the Conciliation Board, which has proved so satisfactory during the past two or three years. For house-fire coals, the demand is moderate, with prices firm at the full list rates of 13s. 4d. to 13s. 10d. per ton for best Wigan Arley, 11s. 8d. to 12s. 6d. for Pemberton four-feet and seconds Arley, and 11s. for common house coal. Common round coals have been in brisk request; and with rather a shortness of supplies for steam and forge purposes, are readily fetching 10s. 6d. to 11s. per ton at the pit, while for engine classes of fuel, in which the greatest scarcity has been

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experienced, all sorts of prices have been obtainable in the open market for prompt supplies. From 10s. 6d. to 11s. per ton has been paid for any description of engine fuel for immediate delivery; but the ordinary pit prices remain on the basis of 9s. 6d. per ton for best sorts, 8s. to 8s. 6d. for medium, and 7s. 6d. for common slack. For shipment, there has also been a shortness of supplies at the ports on the Mersey; and 12s. 6d. per ton and upwards has been got for steam coals delivered at Garston Docks, the High Level, Liverpool, or the Manchester Ship Canal.

Northern Coal Trade.—The scarcity caused by the holidays has tended to drive up the prices of several kinds of coal further; and the markets have been firm for all classes of fuel. In the steam coal trade this has been marked; and best Northumbrian steam coals have risen to about 17s. to 17s. 6d. per ton f.o.b. For steam smalls, there has been an advance which brings up the price to 10s. per ton—the highest quotation for a long period. Gas coals have been extraordinarily scarce; and where the need is pressing, high prices have been paid—as much as 17s. 6d. and 17s. 9d. per ton f.o.b. having been given for lots of a few hundred tons each, for delivery within the next ten days. Naturally, this has roused interest in some of the large contracts, which fall to be renewed in the next month or so, and which coalowners expect will in some measure follow the course of market prices. There is no change in the price of smithy coals. In regard to gas coke, prices are still unequal. There are old contracts that are running at low figures; and yet, on the other hand, as high a rate as 18s. per ton f.o.b. has been asked this week, though the medium quotation is possibly 2s. per ton lower, taking deliveries of all kinds into account. The output of gas coke is well taken up.

Scotch Coal Trade.—It is impossible to give any idea of what is being done in coal sales. The prices are what can be obtained; and therefore no quotations can be given. The situation is a most undesirable one, because one purchaser says he is getting his coal at only one-sixth advance, while another complains of the price being put up to him to the extent of one-half. There is nothing satisfactory about the present state of matters. There is a great abundance of coal, if only it could be disposed of. That there is no scarcity, is shown by the fact that the miners have not been called upon to work at all during the holidays. The shipments for the last week of the past year amounted to 210,368 tons—an increase of 27,483 tons upon the previous week, and of 36,471 tons on the corresponding week of last year. For the past year, the total shipments amounted to 8,982,709 tons—a decrease of 704,740 tons compared with 1898. The decrease is chiefly accounted for by the heavy export trade during 1898, brought about by the strike in Wales.

The Bagshot Gas-Works in the Market.—Acting upon instructions received from the Executors of the late Mr. R. Kemp, Mr. Alfred Richards will offer for sale, on the 30th inst., at the Mart, Tokenhouse Yard, the freehold gas-works at Bagshot. The property, which consists of two holders, a retort-house containing ten retorts, coal-store, condenser, two purifiers, and governor-house, together with the whole of the mains, will be sold as a going concern.

Additional Storage at the St. Anne's Gas-Works.—Owing to the need for increased storage, the Directors of the St. Anne's Gas Company have put in hand a new gasholder, which is to be erected in readiness for next winter. It will have a capacity of 250,000 cubic feet, and will store three times as much gas as the present holders are capable of containing.

Windsor Corporation Water Accounts.—The Borough Treasurer of Windsor (Mr. W. Beach) has issued his abstract of accounts for the year ending Michaelmas last. Regarding the water accounts (which are audited by Messrs. Lass, Wood, and Co.), it is shown that the profits have grown from £4593 in 1892-3 to £5698 in 1898-9. The working expenses have not increased much, having only risen from £1847 in 1892-3 to £2036 in 1898-9. The assets have also increased in like proportion. The total amount of capital that was authorized to be borrowed under the Corporation Act of 1884 was £194,780, of which £29,780 remains to be borrowed if necessary; and out of the sum actually borrowed there still remains £703. The general balance-sheet shows that the assets exceed the liabilities by a very considerable sum.

Dorking Water Company and the Local Authorities.—An important discussion affecting the future of the water supply of Dorking took place at a recent meeting of the Rural District Council. The question arose on the receipt of a letter from the Urban District Council inquiring whether the rural body would be willing to co-operate with them in a petition against, and opposing, if necessary, the Water Company's Bill to be brought before Parliament next session. Mr. Scales explained that a short time ago it was desired to purchase the water undertaking; and application was made to the Local Government Board to know really what were the Council's powers in the matter. The reply was that the Company having an area over and above the area of the Council, they could not purchase it themselves. Now in the Bill the Company were promoting there would be no clause to allow either or both Councils to acquire these works hereafter if they so desired; and the Parliamentary Agents advised that this was a very good chance to get one inserted. Colonel Lewin said he had no hesitation in moving that they definitely refuse to co-operate with the District Council in the way suggested. They had here an admirable illustration of the way in which public money was wasted. Here they had two Councils who, because they could not agree on a matter of public interest, wanted to spend perhaps £1000 to £2000 on lawyers. The Rural Council were willing and anxious to co-operate with the Urban Council in purchasing the undertaking; and the Water Company were willing to sell. He believed the Company had agreed upon a price which the Urban Council considered a fair one. After some discussion, Colonel Lewin moved that an offer be made to join the Urban Council in appealing to the Company to cause the desired clause to be inserted without recourse to legal proceedings; and this was passed. At a subsequent meeting of the Urban District Council, the accuracy of several of the statements made by Colonel Lewin was denied; and it was also asserted that a price for the Company's property had never been agreed upon. It was decided that a Committee should be appointed to meet a Committee of the Rural Council.

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Hastings Water Supply.—Last Wednesday, a Local Government Board inquiry was held at Hastings, by Mr. Walter A. Ducat, into the application of the Corporation for a loan of £1094 for works of water supply. The Town Clerk (Mr. B. F. Meadows) and the Borough Engineer (Mr. P. H. Palmer) explained that the works consisted chiefly of the extension of mains.

Bolton Corporation Water Supply.—The Bolton Corporation have received sanction from the Local Government Board to borrow £8034 for water-works purposes. Of this amount, £5000 is for the construction of filters at the Dingle reservoir; and the Board require that the filtered water should be tested from time to time, especially in rainy weather, with the view of ascertaining its probable action on lead—the result of the tests to be forwarded to Whitehall. The sum of £3034 is required for a new main to Middle Hulton, one of the eight townships recently added to the borough.

Ilfracombe Water Scheme.—At the statutory meeting of ratepayers, a large majority approved of the promotion of the Bill by which the Ilfracombe District Council are seeking for power to obtain a supply of water from Exmoor. There was, however, some opposition, led by two dissentient members of the Council, who contended that the present supply is adequate, and said that the cost which was at first estimated at £24,000, was now put down at £44,000. The voting showed that of those present about 100 were in favour of the scheme, and only eight against. A poll was demanded; and on the result will depend whether the Bill is further proceeded with.

The Lighting, Water Supply, and Sanitation of Colombo.—In the course of a paper on "Old and New Colombo," recently read by Mr. John Ferguson before the Society of Arts, he said: "As regards the amenities of the city, it cannot yet be said to be altogether well lighted, although gas, introduced twenty years ago (chiefly through the efforts of Sir John Grinlinton), with incandescent lamps, and even electric lighting of recent times in the Fort, hotels, clubs, &c., have made a great improvement. Colombo is a town of magnificent distances, and it is difficult to overtake its requirements fully in lighting. More important is a good supply of pure water; and this was brought in by Mr. Bateman and his lieutenant, Mr. Burnett, by a scheme which tapped a hilly region, specially reserved, some thirty miles off. The piping is now being duplicated so as to make the supply adequate for all requirements. But Bombay, in its experience of plague, the germs of which revel in a damp soil, has taught us the danger of an Eastern town becoming water-logged through provision, by means of adequate drainage, not being made to take away the waste or surplus water supply. Colombo—in the flat portion of its Pettah, or native town, especially—stands much in need of systematic drainage, and the present Governor has had a survey, report, and estimate from a leading London sanitary authority—Mr. James Mansergh, M.Inst.C E.—on which, we trust, action may ere long be taken. The disposal of sewage by burning and burying is effectually carried out, and sanitation is as well attended to as it can be in a tropical town without systematic drainage, and with a people, many of whom do not understand that 'cleanliness is next to godliness.'"

The Proposed Purchase of the Cambridge Water-Works.—A private meeting of the 25 members of the Cambridge Corporation who, by their votes, authorized the promotion of a Bill to acquire the local tramway and the water-works undertaking, was held last Wednesday, when it was resolved by a good majority, in view of increased opposition to the Bill, to proceed no further in the matter. This, however, does not preclude the taking of the poll of ratepayers and owners; but no definite movement appears to have been made in that direction yet.

The Progress of the Mourne Mountain Water Scheme for Belfast.—During the past year, steady progress was made with the works for bringing to Belfast the new supply of water from the Mourne Mountains. The service reservoir at Knockbrickan, within a few miles of the city, is completed; and the main aqueduct, extending from the reservoir to Newcastle, including a tunnel 5580 yards in length, is practically finished. Good progress has been made with the boring of the tunnel under Donard Lodge. The entire length of the tunnel is 3767 yards, and 3330 yards have been got through; leaving a length of 437 yards to be driven. At the present rate of progress, the boring should be completed on the 1st of June. Two contracts for the laying of the large mains between the Knockbrickan reservoir and South Parade have recently been let, and a beginning has been made with the work. The iron pipes are being supplied by Messrs. R. Laidlaw and Son and Messrs. Roberts and Co.

The Exmouth District Council and the Water-Works.—A meeting of owners and ratepayers of Exmouth was held last Thursday to consider a resolution passed by the District Council in favour of promoting a Bill empowering the Council to purchase, by compulsion or agreement, the undertaking of the Exmouth and District Water Company, to construct additional works, to supply water within the Council's district, to borrow money for such purposes, and to oppose a Bill to be promoted by the Company authorizing them to extend their undertaking. The Chairman of the Council (Mr. A. A. Carter) presided, and opened the proceedings by simply stating the object of the meeting, and submitting a motion approving of the action of the Council. It was seconded by Mr. C. Salter, who contended that the water supply ought to belong to the town; that those who opposed the action of the Council were interested in the Water Company; and that, although the acquisition of the property might entail some sacrifice now, it would eventually lead to a reduction of rates. Other speakers having supported the motion, opposition was offered, on the grounds, among other things, that with electric lighting and sewerage schemes on hand, the Council had quite enough to do without the water undertaking; that the ratepayers of to-day would not benefit by the acquisition; that the district had been reasonably well supplied hitherto; that, at most, action should be limited to securing the insertion of a clause in the Company's Bill enabling the Council to purchase at a future time; that if the Council succeeded in their proposal the rates would be increased to 5s. 7d. in the pound; that the parliamentary expenses would amount to about £2000; that the plant of the Company, if taken over now, would have to be renewed and extended; and that no tangible benefit would accrue. Eventually, the motion was carried by 276 votes to 39. A poll was demanded, which will be taken in due course.

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Increase in the Price of Gas at Cinderford.—A further advance in the price of coal in the Forest of Dean (the fourth within three months) has resulted in notice being given by the Bilson Gas Company of an increase of 4d. per 1000 cubic feet in the price of gas.

Settlement of Compensation Cases at Manchester.—The Gas Committee of the Manchester Corporation have settled two claims in connection with accidents to workmen. In one case, a claim made by an employee named Henry Ashton (who had been injured by the falling of a main pipe upon him) has been satisfied by the sum of £75. The Committee have also paid £150 to the widow of the late Andrew Cavanagh, in full discharge of all claims consequent upon the death of Cavanagh at the Rochdale Road Gas-Works.

Installation of Water-Gas Plant at the River Plate Gas Company's Works.—Owing to the large increase in consumption in the district supplied by the River Plate Gas Company in Buenos Ayres, the Company have recently purchased additional property, and are carrying out large alterations at their manufacturing stations, particularly at their Corrales works, where, among other things, they are installing carburetted water-gas plant of 700,000 cubic feet daily capacity, supplied by the Economical Gas Apparatus Construction Company, Limited. The Gas Company's Chief Engineer, Mr. J. M. Rowbotham, is supervizing the work, and the extensions are in accordance with his own plans and specifications.

Gas Workers' Wages at Salford.—The Salford Town Council had before them last Wednesday, a recommendation of the Gas Committee that an advance be conceded at the rate of 5 per cent. in the wages of workmen employed at the various gas-stations and in the outdoor department, other than foremen and tradesmen. Alderman Phillips moved the adoption of the report, stating that it was ten years since any alteration was made in the wages at the gas-works; and all through this period the works had been excellently conducted. There was now a similar movement in regard to wages in Manchester; and it was desirable that Salford should travel on the same lines. Alderman Shaw seconded, and the resolution was agreed to.

Estimating the Value of Water-Works.—The appraisal of the plant owned by the Bristol and Warren Water-Works Company, of Rhode Island, was recently made by Mr. D. A. Baker, who was specially appointed for the purpose by the Supreme Court. The Company had an exclusive franchise for fifty years from December, 1881; while the town had the privilege of purchasing the works after they had been in use ten years. Mr. Baker reported that the following factors had been considered in appraising the Company's property: (1) The cost of reproduction of all the plant that could be conveyed to the town of Bristol, less depreciation. (2) The value of the plant as a going concern, and in full operation at the time of the transfer. (3) The goodwill of the plant. (4) The franchise for an unexpired term of 37 years. In estimating its value, Mr. Baker found the present worth of such an annuity as, in his opinion, the franchise would bring to the Company for 37 years. (5) The damages which should be allowed the town because of the Company's failure to fully carry out their contract.

Public Lamps and Sewerage Operations.—The Shrewsbury Gas Company have made a claim against the Shrewsbury Corporation for £1583, for damage alleged to have been done to the street-lighting plant through the carrying out of the Corporation's new drainage system. It has been decided to resist the claim.

A Practical Gas-Fitting Class at the Birmingham Technical School.—Some little time ago the Birmingham Corporation Gas Committee found there was a dearth of qualified gas-fitters in the city; and at their request, the Technical School Committee decided to remedy the defect as speedily as possible. Mr. S. R. Barrett, the Fittings Superintendent of the Gas Department, is engaged in the delivery of a course of theoretical lectures to the students at the Technical School; and at the close a practical class will be established.

Bilston Gas Company.—The annual meeting of this Company was held on Monday last week. The report was noticed in the "JOURNAL" for the 26th ult., and in moving its adoption, the Chairman (Mr. Thomas Holcroft) said the results of the year's working were as satisfactory as they could well be. The quantity of gas manufactured had been increased; and the Directors had been able to maintain the ordinary profits. Speaking of the contracts which had been entered into for the ensuing year, the Chairman referred to the higher rates demanded for coal, and said that they had still further risen since the contracts had been signed. It was impossible to tell what the higher value of coal would result in; but, in all probability, the price of gas would have to be enhanced. The motion was agreed to. It was also decided to declare dividends of 5s. 6d. and 4s. on the "A" and "B" shares respectively; interim dividends of the same amounts having been paid.

Prospective Extension of the Leeds Gas-Works.—At the meeting of the Leeds City Council last Wednesday, the Chairman of the Gas Committee (Alderman Lowden), in the course of some remarks upon the gas undertaking of the Corporation, stated that the Committee had not been behindhand in making provision for a possible increase in the demand for gas as the city and the population increased. During the last four years, the consumption had gone up by no less than 20 per cent.; and it was quite likely that before long they would have to ask the Council for big amounts to enable them to enlarge the works. The manufacture of carburetted water gas was engaging the attention of the Committee; and he thought the time had arrived when they should take some action to provide themselves with this great aid to illumination. They would also have to ask the Council for a considerable sum for the building of additional retort-houses. As far as they could calculate from the figures of the past three years, their present equipment was not more than sufficient to supply the needs of the next three. Alluding to the great difficulty experienced in obtaining coal at the various gas-works of the country, the Chairman said the Leeds works were fortunately situated in this respect. So far, they had not experienced much inconvenience. At the beginning of 1895 the coal in stock was 23,000 tons. Now it was no less than 44,000 tons; and he did not think there would be any scarcity experienced during the remainder of the present winter.

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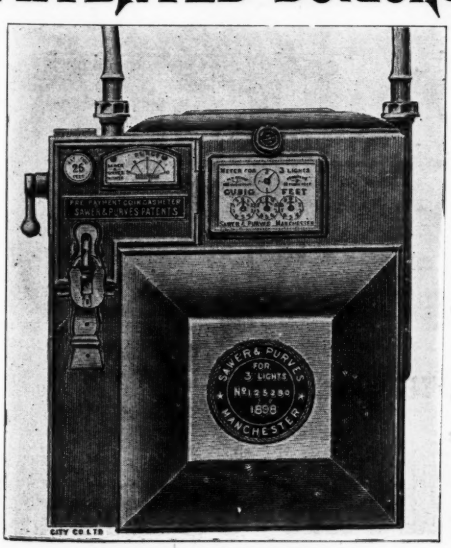
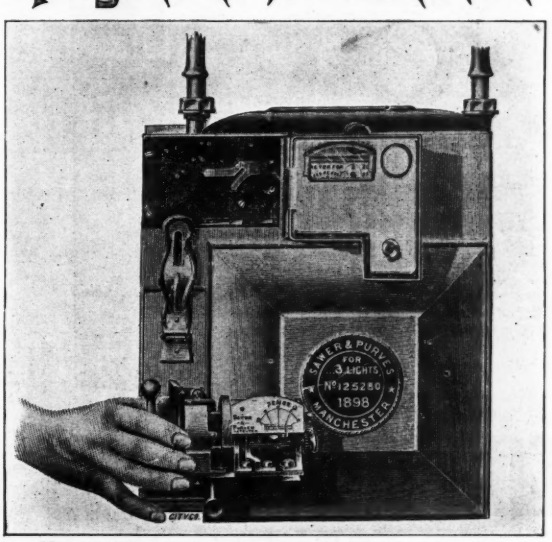


Meter in working position.



Meter with attachment removed without uncoupling.

Increases in the Price of Gas.—Owing to the prevailing dearness and scarcity of coal, the price of gas at Colnbrook, near Slough, has been increased 6d. per 1000 cubic feet. An advance of 5d. per 1000 feet has been made by the Horsham Gas Company.

Curtailment of the Public Lighting at Sheffield.—Owing to the difficulty in obtaining coal for keeping up the supply of gas at Sheffield, Mr. Hanbury Thomas, the General Manager and Secretary of the Sheffield Gas Company, last Thursday asked the Watch Committee of the Corporation to allow the lighting of the public lamps to begin one hour later than the fixed times until further notice. He said the Directors thought if this were done the public generally would accept it as an intimation to be careful in the use of gas until the existing difficulties have been overcome. The Committee agreed to have the lamps lighted half-an-hour later and extinguished half-an-hour earlier than the time stipulated for in the current contract.

Sulphate of Ammonia and Nitrate of Soda in the Past Year.—In his annual report on the chemical trade of the past year, Mr. T. Aikman, jun., states that the opening price of sulphate of ammonia was £10 5s., and the closing value £11 to £11 5s. per ton as in position. As high as £13 was touched in May, and in November £10 10s. was again reached. At no period of the year was there any accumulation of stock. According to Messrs. W. Montgomery and Co.'s report, the development of the nitrate of soda trade continued steadily throughout the year; but in the spring months, owing to the absence of sufficient supplies, a temporary check was experienced, and wide fluctuations in prices resulted. The visible supply amounts to 730,000 tons, against 703,000 tons last year. The total consumption of the world for the past three years has been as follows: 1897, 1,100,000 tons; 1898, 1,186,000 tons; and 1899, 1,330,000 tons. The shipments for the same periods have been 1,060,000, 1,260,000, and 1,360,000 tons respectively. The price on Dec. 31, 1899, was 7s. 9d. per cwt., as compared with 7s. 7½d. and 7s. 6d. on the corresponding date in the two preceding years.

Birkdale again Complains of the Quality of the Gas Supply.—The Birkdale District Council are not yet satisfied with the quality of the gas supplied to them by Southport. Moving the adoption of the minutes of the Lighting Committee at their meeting last Wednesday, Mr. T. O. Clinning said he thought the time had come when they must make the strongest protest possible against the disgraceful gas which had been supplied by the Southport Corporation. They should either urge the Electricity Committee to proceed with their arrangements for supplying the district with the electric light, or endeavour to seek the intervention of the Board of Trade. The Southport Corporation had never made the slightest excuse; and it was most unreasonable to expect Birkdale to accept the gas they supplied. Mr. Davey drew attention to the Inspector's report, which showed that the gas was only 14 98-candle power. If the Southport Corporation could not make gas, Birkdale, he thought, should apply to Parliament with the object of obtaining power to make it for themselves. He had gas-lights in his breakfast-room; and he could not see to read until they had lit four or five candles in addition. The minutes were adopted.

The Great Malvern District Council and the Link Gas-Works.—At the monthly meeting of the Great Malvern District Council last Tuesday, the sanction of the Local Government Board to the raising of £20,000 in respect of the Malvern Link Gas-Works was received.

Protecting the Leeds Water Supply.—In order to place the control of the watershed in the Washburn Valley under the complete control of the Leeds Corporation, and thus ensure that the streams feeding the city's reservoirs shall be free from contamination, it was resolved, at the Council meeting on Wednesday, to purchase certain farms and properties in the district at a total cost of £13,630.

The Water Undertaking of the Dover Corporation.—In presenting the estimates for the year at the meeting of the Dover Town Council last Wednesday, it was pointed out that the water-works had yielded a profit of no less than £3500 on the year. This, together with a profit of more than £2000 on the Municipal electric trams, is equal to a reduction of 1s. in the pound on the town rates. The water is supplied at the rate of 10s. per annum per house of £20 rateable value—one of the lowest rates in the kingdom.

Manchester Corporation Water Supply.—At the meeting of the Water Committee of the Manchester Corporation last Thursday, statistics were presented which showed that during the year ending the 31st of December the average daily consumption of water was 32½ million gallons, as compared with 30¼ million gallons per day during 1898. The present stock of water is equal to a supply for 87 days; whereas at the end of 1898 it was estimated at 141 days' supply. The slight rainfall and snow of the present winter have yielded comparatively little water.

Kidderminster Corporation Water-Works Extensions.—After a somewhat exciting debate at the meeting of the Kidderminster Town Council last Wednesday, a recommendation of the Water Committee was passed accepting the tender of Messrs. Barclay, Sons, and Co., Limited, for engines for a new well in connection with the water-works. Their price was £2805; and the machinery is capable of raising 2000 gallons per minute. Certain amateur engineering members of the Council were anxious to have some of the antiquated plant removed from the old well to the new; but common sense prevailed.

The Price of Gas at Llanelly.—The price of gas to private consumers at Llanelly has been raised from 3s. 10½d. to 4s. 2d. per 1000 cubic feet—an alteration "which is caused by the greatly increased cost of wages and coal, which vary from 10 to 60 per cent." It was announced at a meeting of the District Council last Tuesday that the Company also intended to increase the price of gas for street-lamps and public buildings, which would make an additional sum to be paid by the Council of about £288 per annum, which is equal to a penny rate. Referring to the matter, Mr. Arthur Davies thought they could do nothing except enter a protest. The Clerk considered an agreement should be made with the Company which would prevent such an advance in price being sprung upon them. Mr. L. A. Williams could not understand why gas in Llanelly should be 33⅓ or 50 per cent. higher than in other towns farther removed from the coalfields. Eventually, it was decided to refer the Company's letter to the Highway Committee.

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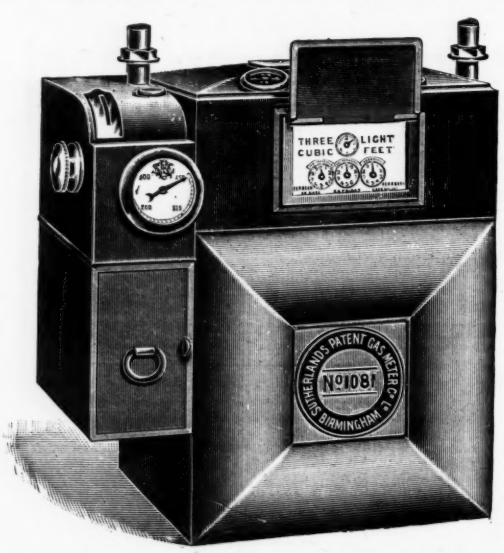

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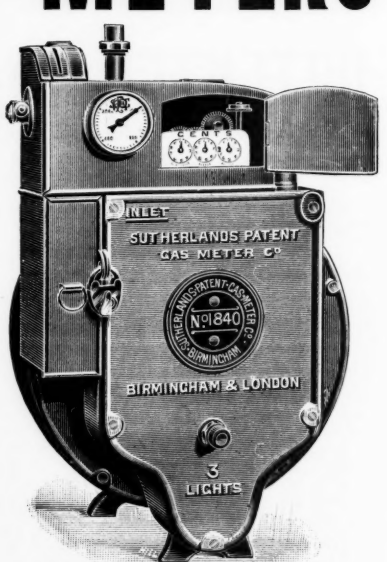

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Mid-Kent Water Company and the Supply of the West Ashford Rural District.—The West Ashford Rural District Council have ordered their seal to be affixed to an agreement with the Mid-Kent Water Company, under which the latter will supply the district. The Company are seeking power to supply Great Chart, Little Chart, Charing, Egerton, Hothfield, Kingsnorth, Pluckley, Shadoxhurst, and Westwell; and the Council have agreed not to proceed with their independent scheme, but to support that of the Company. The Company, on the other hand, have agreed to purchase and take over the water supply and works at Pluckley, and pay to the Council the whole costs, together with the lease of the spring and lands adjoining for 99 years from Sir H. N. Dering. The Council will transfer to the Company the lands acquired to enable them to carry out the now abandoned scheme. The Company will also repay to the Council the sum of £1697 expended on the Charing works, and forthwith commence, and proceed to carry out, all necessary works to enable them to supply water to the parish.

Proposed Extension of the Oldbury Gas-Works.—At a meeting of the Oldbury District Council on Friday, the Gas Committee stated in their report that the Manager (Mr. A. Cooke) had reported that it would very shortly be necessary to increase the manufacturing plant at the gas-works, and erect an additional holder. They had instructed him to obtain particulars and report to them again on the subject. Mr. Thomlinson, in moving the adoption of the report, said the production of gas last year was 106 million cubic feet, and as the works were only erected to supply between 60 and 80 millions per annum, they would have to do something to increase the plant before next October. Mr. Thompson asked if the money for these alterations would be raised by loan or out of revenue. Unless the money for the new holder could be borrowed, it would mean that the Gas Committee would not be able to provide anything in aid of the rates. Mr. Thomlinson said he did not think the Committee would ask the Council to pay for any new plant out of the revenue account, as the rising generation should certainly pay their share. The report was approved.

The Southampton Corporation and the Protection of their Water Supply.—The Southampton Corporation had a special meeting last Wednesday to determine as to the expediency of promoting a Bill to empower them, among other things, to make further provision for the protection from pollution of the water supply of the borough, and for this purpose to enable them to acquire compulsorily or by agreement, or to take on lease, lands in the parishes of Compton and Otterbourne; also to authorize them to make bye-laws for preventing waste. The Parliamentary Committee presented a report which embodied one from Mr. W. Whitaker, F.R.S., in which the acquisition of the lands in question was advocated; and the Water Engineer (Mr. W. Matthews) supported the proposition. The Mayor (Alderman Hussey) moved the adoption of the report; expressing the hope that the Council would have confidence in the Committee, and support their recommendation. The motion having been seconded, a discussion ensued in which it was contended that the purchase of the land was unnecessary, and, moreover, would only increase the already heavy rates. The Council divided, with the result that the motion was rejected by 22 votes to 10—five members being neutral.

The Sudbury (Suffolk) Town Council have decided to increase the storage at their water-works at a cost of £850.

The expenses incurred by the Newtown (Mon.) District Council in connection with the acquisition of the Water Company's undertaking amounted to within a few shillings of £4183.

According to the Bolton Corporation Year Book just issued, there are 37,643 gas consumers in the area supplied by them; and the population of the water limits is 252,000—the area covered being 41,875 acres, with a length of mains extending to 168 miles.

The Gas Committee of the Belfast Corporation have accepted the tender of Messrs. Thomas Glover and Co. for dry meters; and have divided the order for wet meters between Messrs. W. Parkinson and Co., Messrs. W. & B. Cowan, and Messrs. R. Laidlaw and Son.

In reference to the proposed augmentation of the Wallasey water supply, Mr. G. H. Morton, Geologist, of Liverpool, has advised the District Council that, if they sink two boreholes at Liscard to a depth of 800 feet instead of 600 feet as originally intended, with a 15-inch borehole, the supply will exceed a million gallons per day—giving a total supply from Liscard of 2 million gallons.

Mr. Gilbert Little, of Smethwick, confesses to having some doubts as to whether he desires to be known as a Scotsman or an Englishman, seeing that his life has been spent in about equal portions in the two countries; but, at all events, nearly all his hopes, interests, and associations, are now centred in Smethwick. The town has grown in importance of late years; the most recent upward movement being its incorporation. As it now possesses a Mayor, it occurred to Mr. Little that he might introduce into the municipal life of the borough an interesting custom from beyond the Border, and provide a pair of lamps to mark the residence of the Chief Magistrate. The lamps were designed by Mr. B. W. Smith, the Corporation Gas Engineer, and they were lit for the first time on New Year's night; one being started by Mrs. Lones (the Mayoress), and the other by Mrs. Smith.

We have received from Messrs. W. & B. Cowan, Limited, copies of their very neatly got-up diary and price list for the present year. The diary portion is followed by blank leaves for memoranda, letter and address registers, and pages ruled for entering cash received and paid. The Engineering Department of the Leeds Fire-Clay Company, Limited (of which Mr. F. C. Sugden is the Manager), have sent us one of their pocket diaries for this year. It contains illustrated notes on the construction of inclined and horizontal retort settings, particulars of the Company's gas apparatus and general engineering work, coal and coke breaking and conveying machinery, and fire-clay material, and some useful tables. We have also received the revised edition of the quarterly diary and table book of Messrs. John E. Williams and Co., paint, enamel, and varnish manufacturers, of Manchester, attached to which is a £100 insurance coupon in the Ocean Accident and Guarantee Corporation. This is the 23rd year of issue, and in its present form it possesses an additional claim to a place in a gas manager's pocket.

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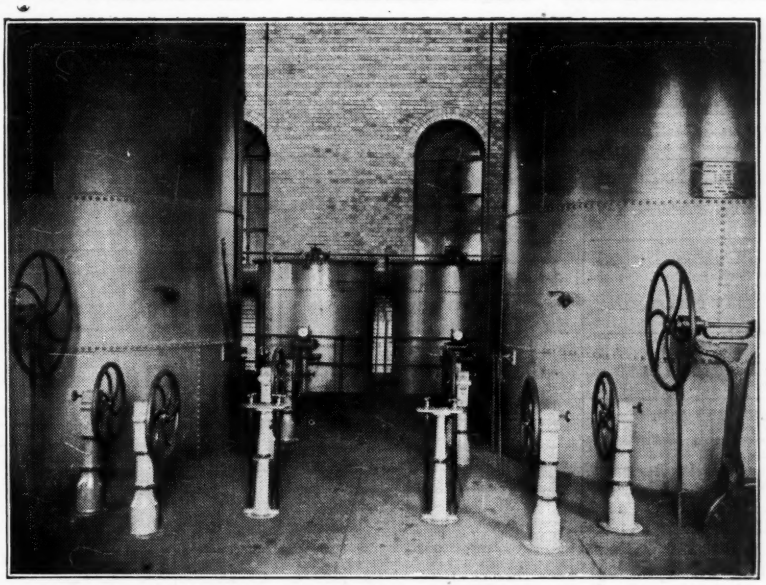

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Telegraphic Address: "SATURATORS, BOLTON."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

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SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SPENT OXIDE wanted.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

TO ENGINEERS OF GAS-WORKS.

A THOROUGHLY experienced Engineer and Draughtsman is open for RE-ENGAGEMENT. Nine Years with Contractors; ten Years in Gas-Works.

Address No. 3411, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER, age 26 (at present engaged), desires appointment as CLERK or COLLECTOR with Gas Company. Well acquainted with Gas Office Routine, Accounts, Correspondence, &c. Good writer, knowledge of Shorthand, Gas-Fitting, and Meters.

Address No. 3410, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Sulphate Maker.

Apply, stating Age, Experience, and Wages required, to the MANAGER, Gas-Works, PETERBOROUGH.

WANTED, a Stoker. Constant Employment. Seven Days.

Apply, stating Wages required, Age, and Reference, to the MANAGER, the Crays Gas Company, St. Mary Cray, KENT.

WANTED, a competent Gas-Fitter, with experience in Main and Service Laying, Reading Meters, &c., and to make himself generally useful on the Works. Wages 32s. per week.

Apply to S. BARK, Gas Office, SUNBURY-ON-THAMES.

WANTED, by a large Gas Company in the South of England, good GAS-FITTERS, able to fix Meters and do high-class Internal Fitting. Permanent Situations.

Apply, stating wages, to No. 3409, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ESTIMATING Clerk wanted by a Firm of Lighting, Heating, and Ventilating Engineers. Must be thoroughly experienced in Gas and Electric Lighting, and well up in Hot Water and Ventilating work.

Apply, with Particulars of Age, Qualifications, and Salary required, to R. & R., Box 877, Sell's Advertising Offices, LONDON.

HORSHAM GAS COMPANY, LIMITED.

WANTED, a competent and steady Man as STOKER, used to Shovel Charging and Exhauster. One with a knowledge of Carburetted Water-Gas Plant preferred.

Apply, at once, with References, Age, &c., to
E. D. SAPEY,
Manager.

Jan. 6, 1900.

WANTED, by a Provincial Gas Company in the South of England, an ASSISTANT GAS ENGINEER and MANAGER. One who has had experience with Regenerative Retort-Settings, Carburetted Water-Gas Plant, and Sulphur Purification preferred.

Apply, by letter, stating Age, Experience, and Salary required, and endorsed "Application," to Messrs. LASS, WOOD, & DREW, 80, Gracechurch Street, LONDON, E.C.

MERTHYR TYDFIL GAS COMPANY.

WANTED, a competent young Man as INSPECTOR of METERS and ASSISTANT CLERK in the Gas-Fittings Department. Wages 25s. per week.

Applications, in own Handwriting, stating Age, where last employed, and enclosing *copies* only of Three recent Testimonials as to Character and Experience, to be addressed to the undersigned not later than Saturday, the 20th inst.

JOHN L. COCKER,
Secretary and General Manager.
Gas Office and Works, Merthyr Tydfil,
Glamorganshire, Jan. 2, 1900.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality.

SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH,

Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application to
No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

FARNWORTH AND KEARSLEY GAS COMPANY.

ASSISTANT MANAGER.

THE Directors invite Applications for the position of ASSISTANT GAS MANAGER. Salary, £125 per annum.

Applications, stating Age, Experience, and enclosing not more than two recent Testimonials, to be addressed to the Chairman of the Company, endorsed "Assistant," and to be delivered on or before Saturday, the 20th inst.

By order,
T. L. SHEPPARD,
Manager.

Gas Offices, Farnworth,
Jan. 3, 1900.

DUNDALK GAS COMPANY.

WANTED, at once, by the Directors of this Company, an experienced and competent GAS MANAGER, to take immediate charge of their Works. (Annual make 35 millions.) He must have a practical knowledge of the Manufacture of Coal Gas, Carburetted Water Gas, Sulphate of Ammonia, and the laying of Mains and Services, upon the most approved modern systems, and have the entire control of the same.

Salary £150 per annum, Residence, Rates, Coal, and Gas free.

Applications, in Candidates' own Handwriting, accompanied by three Testimonials of recent date, to be sent to the Secretary, Dundalk Gas Company, not later than the 20th of January, 1900.

JOSEPH A. COULTER,
Secretary.

URBAN DISTRICT COUNCIL OF BUXTON.

GAS MANAGER.

THE Urban District Council of Buxton require an experienced MANAGER for their Gas-Works.

Candidates must have a thorough knowledge of the Manufacture, Testing, and Distribution of Gas, the Working of Generator and Regenerative Furnaces, and all Residuals. They must be competent, and will be required to design and carry out Extensions on the most approved and modern principles.

Salary £200 per annum, with House, Coal, Gas, and Water free.

Applications, with *Copies* of three recent Testimonials, to be addressed to the Chairman of the Gas Committee, on or before the 15th day of January next, endorsed "Gas Manager."

By order,
JOSIAH TAYLOR,
Clerk to the Council.

Town Hall, Buxton,
Dec. 29, 1899.

IRON ROOF for Sale, 132 feet long by 53 ft. 4 in. Span, in first-class condition.

Apply to CLAYTON, SON, AND CO., LIMITED, Hunslet, LEEDS.

ENGINES and Exhausters, from 3500 to 30,000 cubic feet per hour, in Stock, ready for delivery. No reasonable offer refused.

J. F. BLAKELEY, Thornhill, DEWSBURY.

LIVESEY Washer, 1 Million per diem, 18-inch Valves. MORRIS & CUTLER'S CONDENSER, 18-inch Valves. All in perfect order, and cheap.

J. F. BLAKELEY, Thornhill, DEWSBURY.

RETORT IRONWORK.

RIVETED Wrought-Iron U Hydraulic MAINS, with 5-inch Pipes, 20 in. by 15 in., and 21 in. by 15 in. ∩ MOUTHPIECES, in sets of six and seven, complete. Equal to new, and cheap.

J. F. BLAKELEY, Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

COUNTY BOROUGH OF BURY.

TO RETORT & FIRE-BRICK MANUFACTURERS.

THE Gas Committee are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY required at their Gas-Works.

Forms of Tender may be obtained from Mr. H. Simmonds, Engineer and Manager, Gas-Works, Elton, Bury.

Tenders, sealed and endorsed "Tender for Retorts, &c.," to be sent to the undersigned not later than Monday, the 15th of January, 1900.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bank Street,
Bury, Dec. 29, 1899.

TENDERS FOR GAS COAL.

THE Magistracy of Copenhagen are prepared to receive TENDERS for the supply and delivery of 140,000 Tons of Best GAS COAL during the Year 1900, from April to the end of December.

The Magistracy reserve the right to divide the Contract between two or more Contractors.

Further Information, and Conditions for the delivery, can be obtained on application to Kobenhavns Belysningsvœsen, Vestre Boulsvard, Kjobenhavn, V.

The Tenders should be under sealed envelope, marked "Tilbud paa Kul," and be sent to Magistratens 4de afdeling Lavendelstrœde No. 1 Kjobenhavn K, on or before the 15th of January, 1900, Twelve o'clock, at which time the Tenders will be opened in the presence of the parties tendering who may be present.

THE MAGISTRACY OF COPENHAGEN.

Dec. 19, 1899.

THE Gas Committee of the Corporation of Heywood are prepared to receive TENDERS for the supply of FIRE-CLAY GOODS.

Specification, Quantities, and Form of Tender may be obtained upon application to Mr. W. Whatmough, Gas Manager.

Contractors tendering for this work must pay their workpeople at least the Standard or Trade Union Rate of Wages, and observe the Trade Conditions which attach to the various kinds of work for which the Tender is sent in.

Tenders, endorsed "Fire-Clay Goods," to be sent to me not later than Tuesday, Jan. 16, 1900.

By order,
J. H. BALDWICK,
Town Clerk.

Municipal Buildings, Heywood,
Dec. 20, 1899.

SCUNTHORPE GAS-WORKS.

CONTRACTS Nos. 1 & 2.

THE Urban District Council of Scun- thorpe (Lincolnshire) are prepared to receive TENDERS for the construction and erection of the BUILDINGS and PLANT at their Gas-Works.

Copies of the Specification and the Drawings can be seen on and after Friday, the 5th day of January, 1900, at the Office of the Clerk to the Council, or at the Office of the Engineers, Messrs. Stevenson and Burstal, 38, Parliament Street, Westminster.

Copies of the Tender and Bill of Quantities can be obtained from the above-mentioned on payment of Two Guineas each, which will be returned upon receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed in accordance with the instructions at the head of the Tender, to be delivered to the undersigned, not later than Wednesday, the 17th day of January, 1900.

(Signed) F. C. HETT,
Clerk to the Council.

CORPORATION OF ILKESTON.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the following Plant, to be delivered and erected at their Works, Rutland Street, Ilkeston:—

1. MECHANICAL WASHER-SCRUBBER, to pass 750,000 cubic feet per day.
2. ROTARY EXHAUSTERS, 30,000 cubic feet per hour.
3. COAL UNLOADING AND CONVEYING MACHINERY.

Second-hand Plant for Nos. 1 & 2 will be considered.

Sealed and endorsed Tenders must be deposited with Wright Lissett, Esq., Town Clerk, on or before Jan. 31, 1900.

The lowest or any Tender will not be necessarily accepted, and in any case will be subject to the approval of the Local Government Board, and the usual conditions as to the Standard Rate of Wages.

Full Particulars can be obtained from
F. C. HUMPHRYS,
Engineer and Manager.

Gas-Works, Ilkeston,
Jan. 5, 1900.

URBAN DISTRICT OF WALLASEY GAS-WORKS.

TO ENGINEERS AND OTHERS.

THE Wallasey Urban District Council are prepared to receive TENDERS for the supply and delivery of 36 21 in. by 14 in. SELF-SEALING MOUTHPIECES at the Gas-Works, Poulton, within the said District.

Plans and Specifications of the work may be seen, and any other Information obtained, on application to the Engineer, Mr. J. H. Crowther, Great Float, Poulton, near Birkenhead.

Tenders, on the Form embodied in the Specifications, enclosed in a sealed envelope, addressed to me, and endorsed "Mouthpieces," to be delivered per post at my Office as below, not later than Four p.m. on Thursday, the 18th inst.

The Contractor will be required to enter into a Contract for the due performance of the work.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
H. W. COOK,
Clerk to the Council.

Public Offices, Egremont,
Cheshire, Jan. 4, 1900.

CRYSTAL PALACE DISTRICT GAS COMPANY.

SALE BY TENDER OF £20,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE, £150 PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL, BY TENDER, £20,000 of FIVE PER CENT. PERPETUAL DEBENTURE STOCK, in accordance with the provisions of the Crystal Palace District Gas Act, 1893 (56 and 57 Vic.).

Particulars of same, with Form of Tender, can be obtained at this Office on application to the undersigned; and Tenders must be sent in on or before Thursday, the 18th day of January, 1900.

The Stock will be allotted to the highest bidders; but no Tender will be accepted at a lower price than at the rate of £150 money for each £100 Debenture Stock.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works: Lower Sydenham, S.E.,
Dec. 15, 1899.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburbar, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GUILDFORD GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, the 16th of January, 1900, at Two o'clock.

Particulars of the AUCTIONEER, as above.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 600 £10 ADDITIONAL ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, the 16th of January, 1900, at Two o'clock.

Particulars of the AUCTIONEER, as above.

NEW SWINDON GAS COMPANY.

£960 NEW ORDINARY FIVE PER CENT. STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 16, at Two o'clock.

Particulars of the AUCTIONEER, as above.

By order of the Directors of the
LOWESTOFT WATER AND GAS COMPANY.

£2500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK AND 500 £10 SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 30, 1900, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £2800 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Tuesday, the 30th of January, 1900, at Two o'clock, in Lots,

£2800 OF NEW ORDINARY STOCK IN THE ABOVE UNDERTAKING,

Ranking for a Standard Dividend of 7 per Cent., subject to the Sliding-Scale; the last Dividend on similar Stock in the Company having been 12½ per cent.

Particulars of the AUCTIONEER, as above.

By order of the Executors of the late Mr. R. Kemp.

The FREEHOLD GAS-WORKS, situate at BAGSHOT, SURREY, within a short distance of the Station, and comprising two Gasholders, Retort-House (with ten Retorts), Coal-Store, Condenser, two Purifiers, and Governor-House, together with the whole of the Mains, to be sold as a going concern, and with possession on completion of the purchase.

MR. ALFRED RICHARDS has received Instructions to SELL THE ABOVE BY AUCTION (in conjunction with Messrs. WALKER and FINN), at the Mart, E.C., on Tuesday, Jan. 30, at Three o'clock precisely.

Particulars of Messrs. REEP, LANE, & Co., Solicitors, BAGSHOT; of Messrs. WALKER AND FINN, Auctioneers, EGHAM; and of Mr. ALFRED RICHARDS, 18, FINSBURY CIRCUS, E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

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GEORGE LIVESEY, M.Inst.C.E.

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BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per Ton. .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

LONDONDERRY GAS COALS
FROM THE
LONDONDERRY COLLIERIES,
COUNTY OF DURHAM.

Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR,
COUNTY OF DURHAM.

HOLMSIDE
GAS COALS.
Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . .	11,205 Cubic Feet.
Illuminating Power	16 $\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality)	13 $\frac{3}{4}$ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.
Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

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FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:
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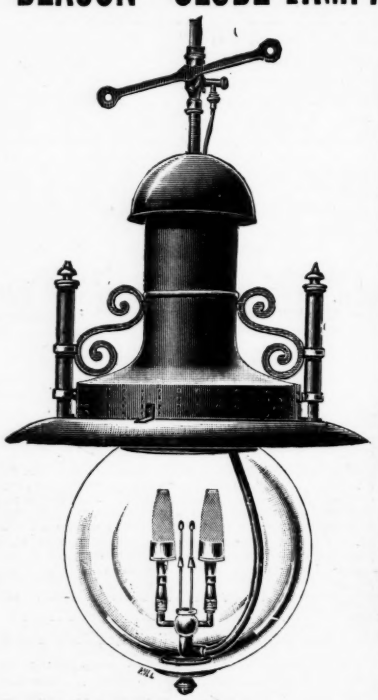

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Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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Yield of Gas per Ton . . 10,500 Cubic Feet.
Illuminating Power . . . 16·4 Candles.
Coke . . . . . 68 per Cent.

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The Wallsend & Hebburn Coal Company, Ltd.
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W. RICHARDSON, Fitter.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

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CHESTERFIELD.

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INCREASE YOUR ILLUMINATING POWER
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WHESSOE-MUNICH BENZOL CARBURETTER
The Cheapest and Best in the Market.
The Managers of Tynemouth, Middlesbrough, and Darlington Gas-Works are much pleased with it, and would not be without it.
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PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

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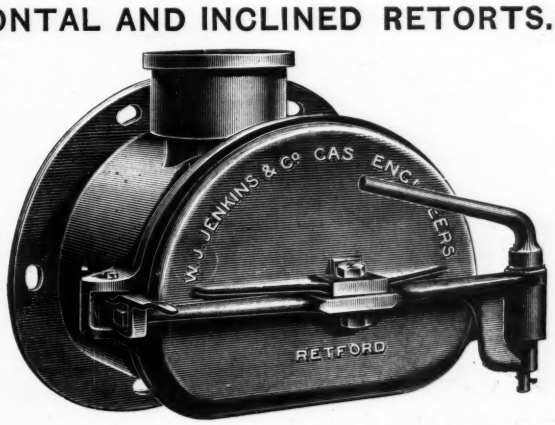

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A SYSTEM OF BURNING VAPOURIZED PETROLEUM WITHIN AN INCANDESCENT MANTLE.

A Light of 1000-CANDLE POWER produced at a cost of less than

ONE PENNY PER HOUR.

STREET-LAMPS—Self-Contained Plant, easily fixed, no tearing up of Thoroughfares.

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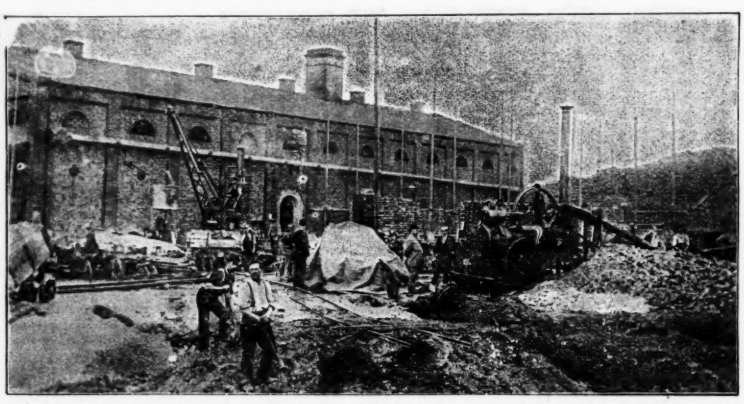

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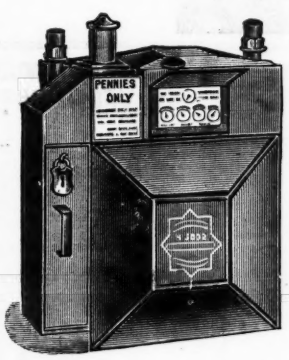

THE ADVANTAGES OF OUR METER ARE—

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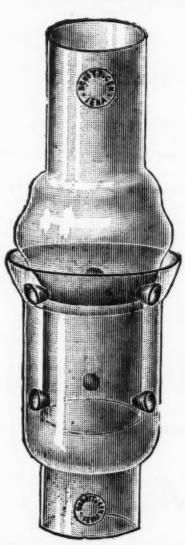
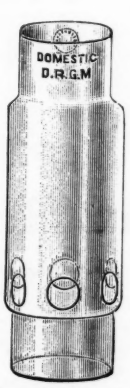


The "SUSPENSION SET" for Street Lighting and for Draughty Places.



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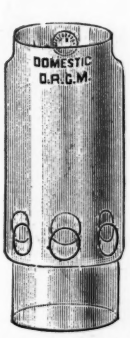

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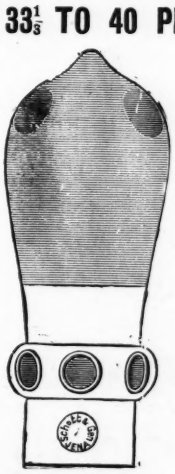

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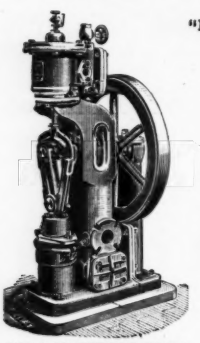

"Fig. 705. SINGLE RAM" STEAM-PUMP.

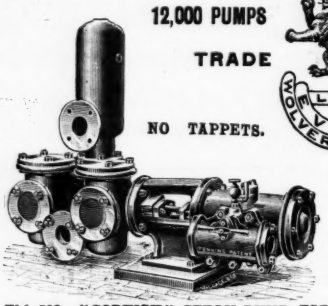

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

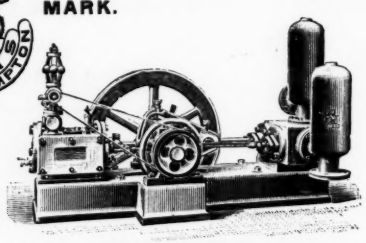

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

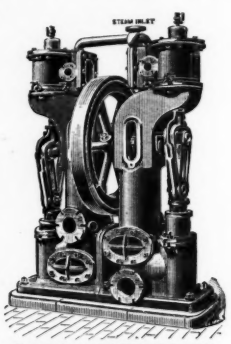

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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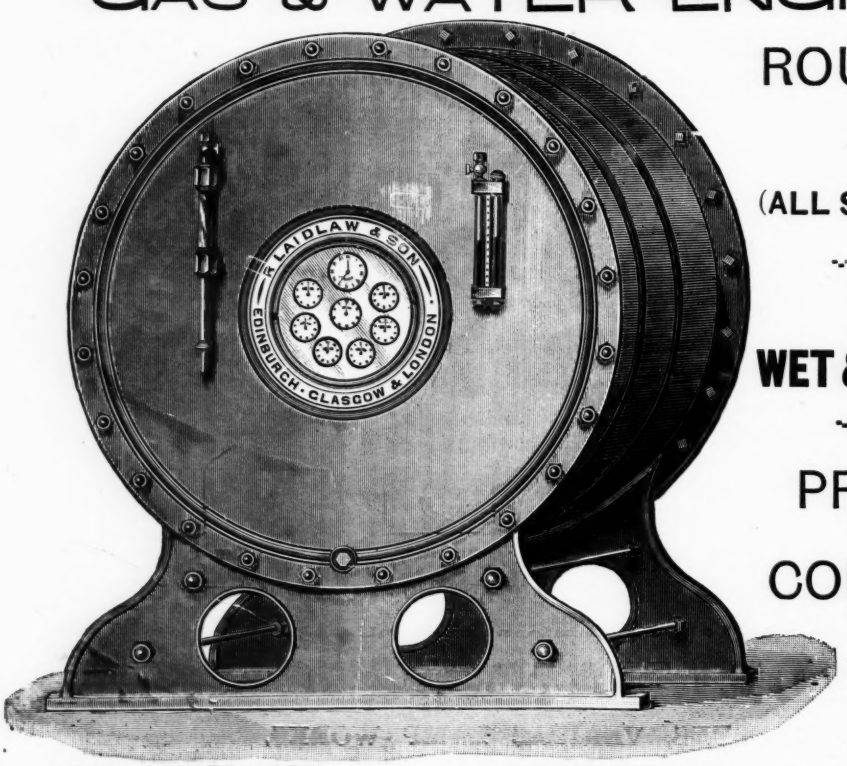
GAS & WATER ENGINEERS.



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NEW SUNLIGHT INCANDESCENT COMPANY, LIMITED,

33 & 34, SHOE LANE,

LONDON, E.C.,

Dec. 28, 1899.

SUNLIGHT WHITE MANTLES.

Dear Sir,

Referring to an advertisement of the Welsbach Company which has just appeared claiming that it "is doing its best to accelerate the action against our White Mantle," we beg simply to state that, having asked the permission of the Court to administer certain interrogatories to the Company and its servants - the fairness of which has, of course, to be judged by the Court before we administer them - we have been met by an announcement that the Welsbach Company's officials will refuse to answer these interrogatories, and will take this preliminary point up to the House of Lords. This is what is termed "accelerating the action."

We take this opportunity, however, to remind our customers that, with every mantle we sell, we are prepared to give the most ample guarantee to the buyer.

We would further remind the Trade generally of the great risk they are running in dealing in the Kern (new Welsbach) Burner. We have commenced actions both for the revocation of the Kern Patent, and for infringement by the Welsbach Company of our DeMare Patent, which Kern attempted to purchase "in order to protect the Kern Patent."

Should any general Reduction take place in the Prices of our Burners or Mantles, full credit will be granted on Stocks in the hands of our Agents or the Trade, if ordered subsequent to the date of this announcement.

NEW SUNLIGHT INCANDESCENT COMPANY, LTD.,

L'ce Fletcher,

Secretary.

S. CUTLER AND SONS, MILLWALL, LONDON.

GASHOLDERS

OF EVERY SIZE AND DESCRIPTION.

CUTLER'S PATENT GUIDE-FRAMING HAS BEEN ADOPTED FOR MANY IMPORTANT HOLDERS.

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Over 120 now in use.

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For keeping Cups of Gasholders free from Ice.

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The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

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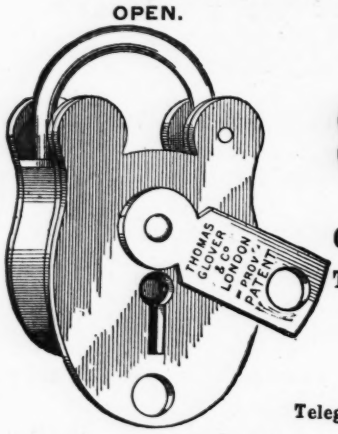

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PREVENTS TAMPERING WITH THE

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The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

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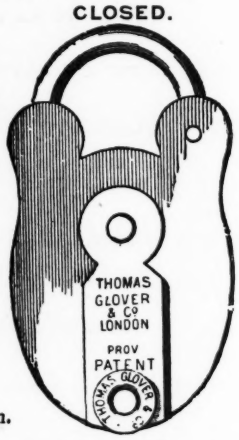

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WITHOUT CHIMNEYS.

The "SMALL TORCH" Burner (Bandsept Patent) for Street Lighting, consuming 3½ feet of Gas per hour. Having an efficiency of 25-Candle Power per Cubic Foot of Gas consumed, it is not only the BEST but CHEAPEST Intensive CHIMNEYLESS Burner on the Market.

PRICE COMPLETE WITH MANTLE

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All other Burners supplied by the Syndicate proportionately Reduced from January 1, 1900, full Particulars of which will shortly be issued to the Trade, and followed by new and complete Catalogue.

NOTE—THE DENAYROUZE LIGHT SYNDICATE has carried out the work in connection with all the Installations of Van Vriesland's Oil Gas in England, together with the entire work and fitting of the Grand Exhibit in North West Gallery for the Gas and Allied Trades Exhibition to be held at the Royal Aquarium, Westminster, from Dec. 21, 1899, to Jan. 23, 1900, where all their Burners can be seen in operation.

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SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of **LYON'S "PATENT" GAS-MAIN SYPHONS.**

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ON THE CONTINUOUS SYSTEM

Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.

Old Systems easily and cheaply converted.

ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

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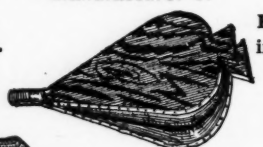

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India-rubber Hose, Sheet, and Washers of every description, Leather Bands, Oils, &c., Diving and Wading Dresses, Waterproof Coats, Capes, and Sewer Boots.

Stokers' Mitts, from 14s. doz.

Special Air Tubing made for Gas Companies.

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Patent Automatic Machinery

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DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

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[See Illustrated Advertisement, Jan. 2, p. 56.]

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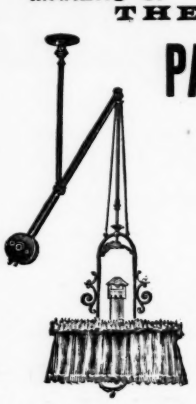

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WITH PATENT SHADE.

The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.

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THE INCANDESCENT GAS-LIGHT

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MILNE'S PATENT COMPOSITE DRY GAS-METER

THE WORKING PARTS OF A TIN-CASE DRY METER ENCLOSED IN A TWO-PART IRON-CASE.

THIS Meter combines all the advantages of the Dry Gas-Meter with the strength and durability of the Wet Meter. It consists of Cast-Iron Cases front and back enclosing the bellows, and screwed to each other with the Division-Plate between; while the upper portion containing the Valve Chambers and Index is made of extra thick Tinned Iron—the Side Tubes being made of Brass, with suitable provision for Trapping any Condensation.

It is well known that the only parts of an ordinary Tin-Case Dry Meter which are attacked by outside Corrosion are the bottom and the lower parts of the sides, and also the side tubes. In this Composite Meter, these parts are made either of Cast-Iron or Brass; and thus rapid deterioration is prevented, and the weight is not unduly increased.

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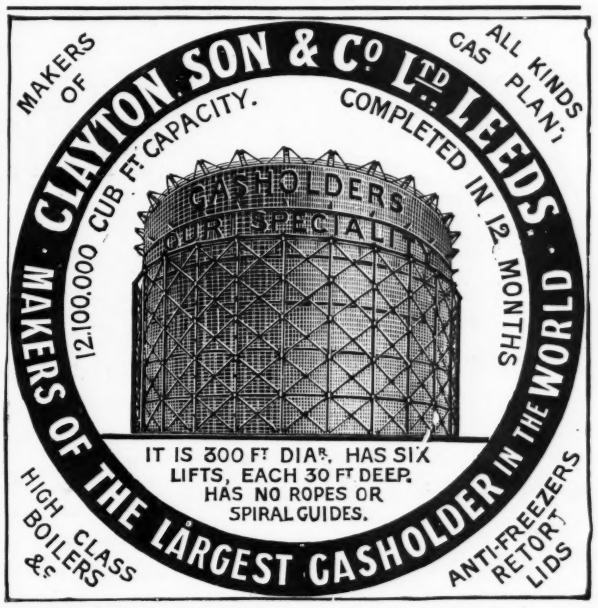
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GASHOLDERS
OUR SPECIALITY
IT IS 300 FT DIAM. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
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HIGH CLASS BOILERS &c
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Telegraphic Address: "SCRUBBER, MANCHESTER." National Telephone: Nos. 54 and 2296.

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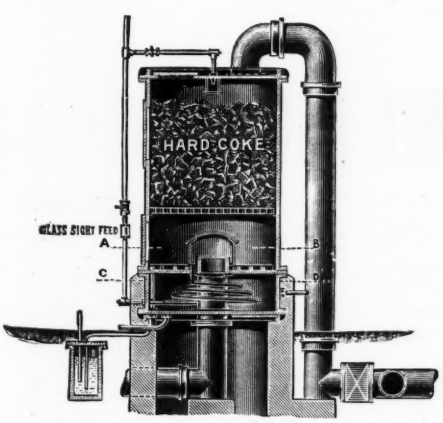

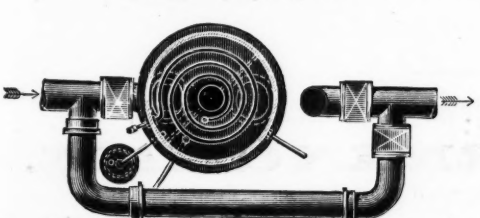

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CARBURETTOR

FOR ENRICHING COAL GAS, AND FOR

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IN GAS-MAINS.

PRICES ON APPLICATION.

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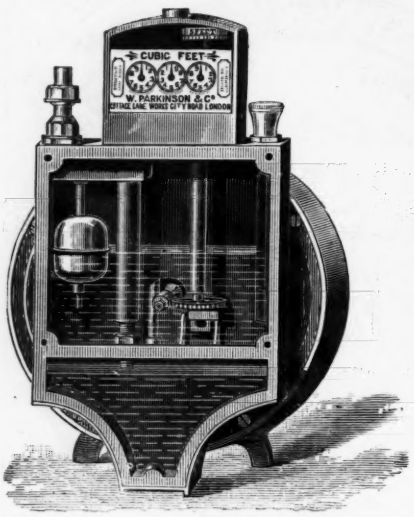
W. PARKINSON & CO.

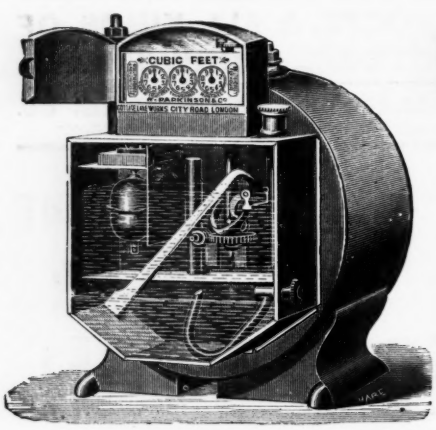
OLDEST ESTABLISHED FIRM IN THE TRADE.



ORDINARY WET METERS

IN CAST-IRON CASES.

Work with very little friction. Will stand very high pressures. Cannot possibly be shut off by sudden increase of pressure, the Float being affected by Outlet Gas only. Allow for loss of water by evaporation without materially affecting the registration or shutting off the gas. Unexcelled for simplicity of construction, excellence of workmanship, or accuracy in registration.



COMPENSATING METERS

IN TINNED OR CAST-IRON CASES.

The Slow-Spoon Compensator has been in extensive use for many years; it maintains an unvarying water-line without appreciable friction, and provides a large reserve of water. The Float arrangement allows sudden or excessive pressure on the Inlet without affecting the working of the Meter or extinguishing the Lights.

DRY METERS.

These Meters are unsurpassed for accuracy of registration. The cases are made of the best Charcoal Tin Plates; and each part of the Meter is stamped by special Machinery to ensure uniformity and exactness in construction. The Diaphragms are all of the best Persian Sheep Skins, carefully selected, and the brasswork and smaller fittings are of superior workmanship.

COTTAGE LANE WORKS, CITY ROAD.

LONDON.

Telegrams: "INDEX." Telephone No. 778 King's Cross.

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BIRMINGHAM.

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[See also Advt. on p. 72.

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